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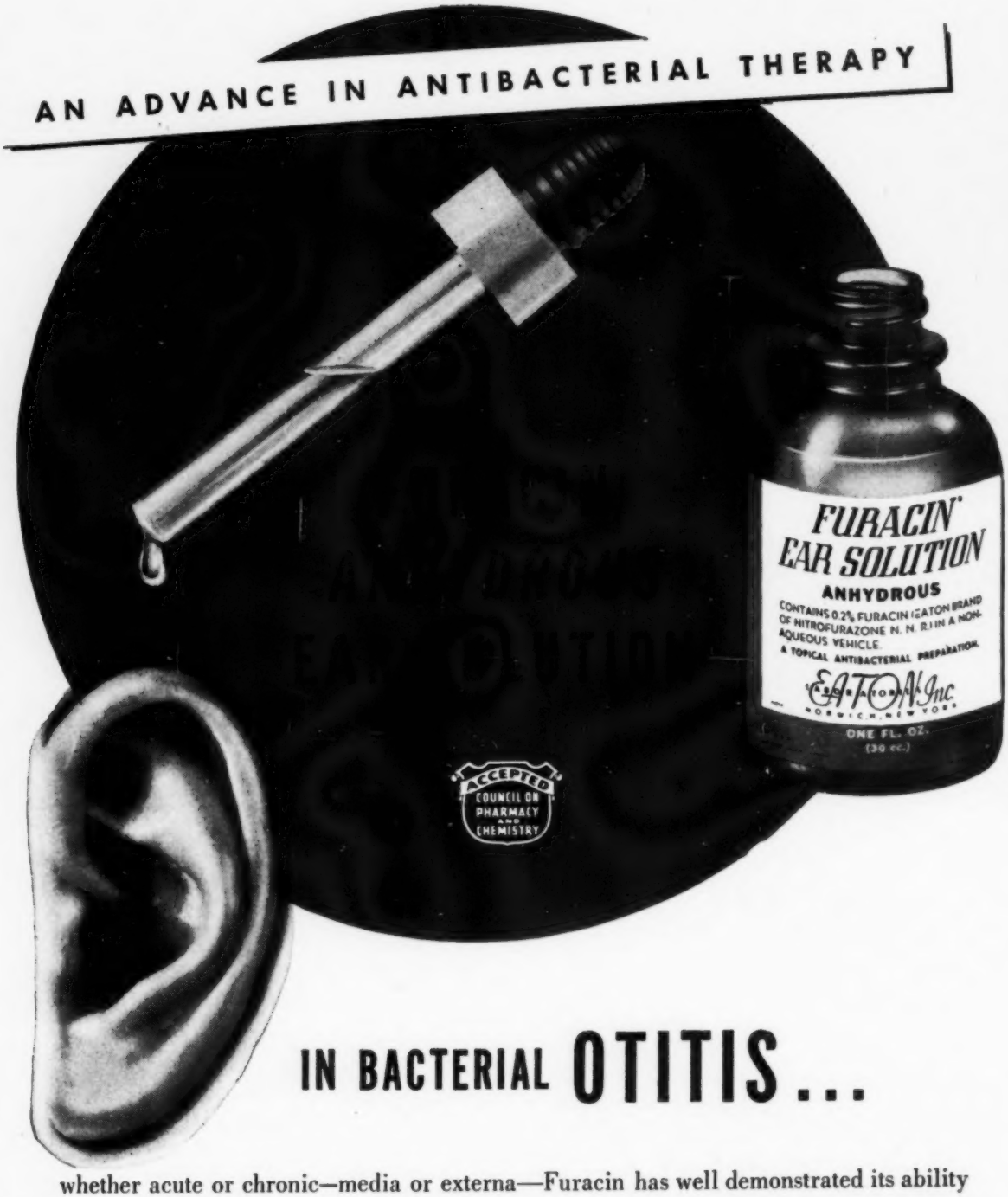
Volume 19 November 1950 Number 11

AN ADVANCE IN ANTIBACTERIAL THERAPY



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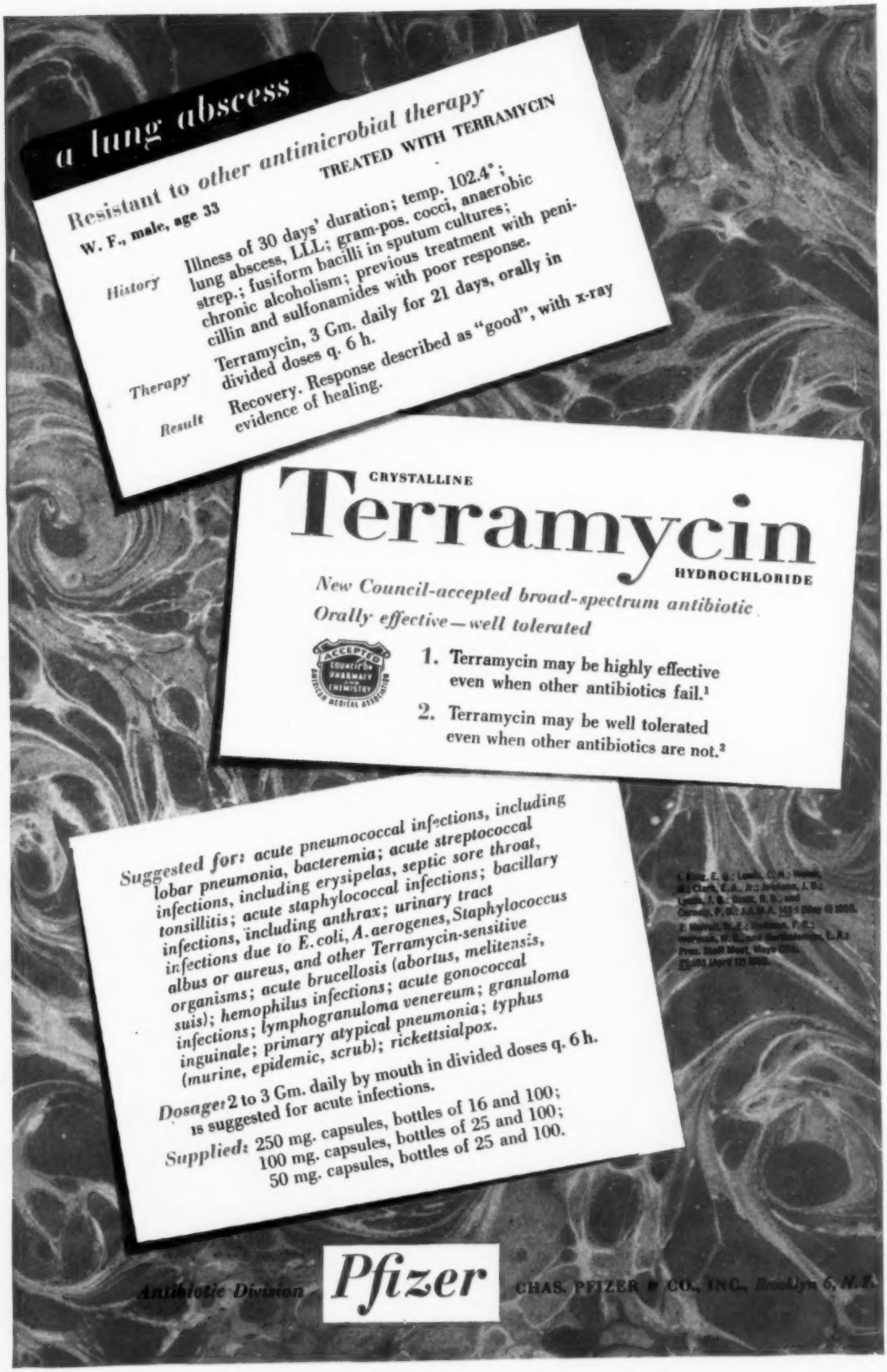
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History
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Result
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Orally effective—well tolerated
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This magazine is published to promote sound thought concerning industrial medicine and the surgery of trauma. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited. The editors will exercise care in checking on the accuracy of data printed but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same in the current or any subsequent issues as they may be inclined.

Volume 19 NOVEMBER 1950 *Number 11*

CONTENTS

CARDIOLOGY

ROUTINE ELECTROCARDIOGRAPHY IN INDUSTRY.....B. M. Overholt, M.D. 503
CORONARY HEART DISEASE AND THE EMPLOYEE.....Arthur J. Geiger, M.D. 509
ACUTE CORONARY ARTERY DISEASE, AND EFFORT.....Arthur M. Master, M.D. 512
RHEUMATIC HEART DISEASE AND EMPLOYMENT.....Benedict R. Harris, M.D. 513
OCCLUSIVE DISEASES OF THE ARTERIES.....Hugh Montgomery, M.D. 517
THE TREATMENT OF CAUSALGIA AND ALLIED DISORDERS IN EMPLOYED PERSONS.....Benjamin B. Whitcomb, M.D. 519
PLACEMENT OF THE EMPLOYEE WITH CARDIAC AND VASCULAR DISEASE IN INDUSTRY.....Crit Pharris, M.D. 523
PSYCHOLOGICAL CONSIDERATIONS IN THE REHABILITATION OF THE CARDIAC PATIENT IN INDUSTRY.....Edward Stainbrook, M.D. 528
MANAGEMENT OF THE EMPLOYEE WITH HYPERTENSIVE CARDIOVASCULAR DISEASE.....John C. Leonard, M.D. 532
TOXICOLOGICAL AND METABOLIC EFFECTS OF FLUORINE-CONTAINING COMPOUNDS.....Joseph Larner, M.D. 535
THE NATION'S CENTER OF INDUSTRIAL HYGIENE RESEARCH: CINCINNATI..... 540
ASSOCIATION NEWS..... 542
INDUSTRIAL MEDICINE IN THE PUBLIC EYE..... 543
EDITORIAL: An American Board of Industrial Medicine; "Cardiacs" are Employable; The Macropygian Industrial Worker; The Miracle of the Month Club..... 545
ASSOCIATIONS: OFFICERS AND DIRECTORS.....4, 6, 8, 10
PERSONAL NEWS..... 6
NEWS, COMMENT, OPINION..... 27
(ADVERTISERS' INDEX..... 42)

[NOTE: The opinions expressed in the editorials of this Journal are not to be considered as necessarily representing the opinions of any associated organizations.]

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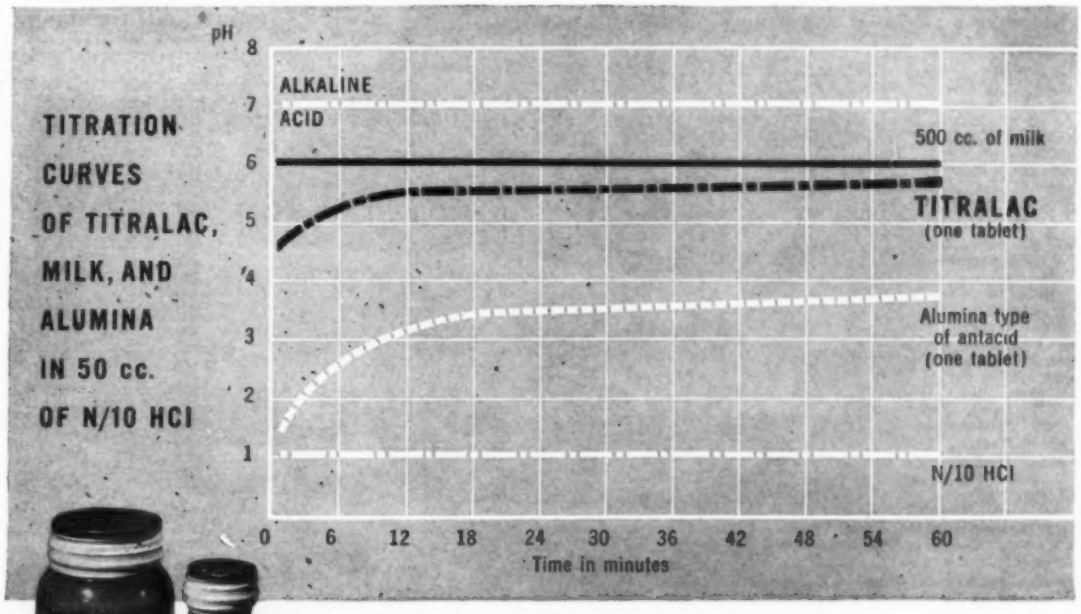

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1. Rossett, N. E., and Flexner, J.: Ann. Int. Med. 18: 193 (1944). 2. Freezer, C. R. E.; Gibson, C. S., and Matthews, E.: Guy's Hosp. Reports 78: 191 (1928). 3. Aaron, A. H.; Lipp, W. F., and Milch, E.: J. A. M. A. 139: 514 (Feb. 19) 1949. 4. Kirsner, J. B., and Palmer, W. L.: Illinois M. J. 94: 357 (Dec.) 1948. 5. Kimball, S.: in Practice of Medicine (Tice). Hagerstown, Md., W. F. Prior Company, Inc., 1948; p. 210. 6. Special Article: M. Times 76: 10 (Jan.) 1948.

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GEORGE O. NELSON, M.D., has joined the staff of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, as Assistant Manager of the Industrial Toxicology Department. DR. NELSON received his B.S. from Tufts College, and graduated from the College of Physicians and Surgeons of Columbia University in New York City. He interned on the Harvard Service of Boston City Hospital, and had a residency at Pratt Diagnostic Hospital in Boston. He served as instructor in medicine at Tufts Medical School during his residency. He is a Diplomate of the National Board of Medical Examiners. He has had five years' experience in industrial medical practice, including the Assistant Medical Directorship of the Ordnance Plant of Hercules Powder Company at Radford, Virginia, and as Plant Physician for the plants of American Viscose Corporation and Monsanto Chemical Company at Nitro, West Virginia. In addition to his industrial medical work, he had a private practice in Nitro, West Virginia, for the past three years.

ARTHUR E. SULEK, M.D., has been appointed Medical Director at Nordberg Manufacturing Co., Milwaukee, Wisconsin. DR. SULEK graduated M.D. at Iowa Medical College in 1936, took his internship, and was house physician and surgeon, at St. Mary's Hospital, Detroit, 1936-38. In 1950, he received his M.P.H. in Industrial Hygiene at Harvard School of Public Health. From January 2, 1941, to May 1, 1948, he was in the Army; he was Chief of Surgical Service in a 1000-bed hospital in the South Pacific, from July, 1942, to May, 1944. He held the rank of Lieutenant Colonel.

THE Bethlehem Steel Company Medical Department had a scientific program on Industrial Medicine at a meeting of the Northampton County Medical Society at Bethlehem, Pennsylvania, September 26, 1950. DR. M. P. CHARNOCK, Plant Surgeon, explained the medical and industrial hygiene program carried out at the plant; DR. JOSEPH P. ROBINSON, a member of the plant's staff, gave a report on chest x-rays given 14,500 em-

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ployees; DR. LAWRENCE SMYTH spoke on cardiovascular diseases; DR. PAUL J. BAMBERGER, on cardiac diseases, and WILLIAM E. JOHNSON, on industrial hygiene.

ASSISTANT SURGEON GENERAL R. E. DYER, Director of the National Institutes of Health, retired on October 1, after 34 years in the Public Health Service. He has accepted appointment as Director of Research at the Robert Winship Clinic of the Emory University Medical School. DR. DYER has served since 1942 as Director of the National Institutes of Health, research branch of the Service, with permanent laboratories at Bethesda, Maryland, and field research projects in many other places in this country and abroad.

FREDERICK J. WAMPLER, M.D., Chief of Field Party, Institute of Inter-American Affairs, Division of Health and Sanitation, at Lima, Peru, has been transferred to the Health and Sanitation program, of Paraguay. He can be addressed at the American Embassy, Asuncion, Paraguay.

EDWARD C. HOLMBLAD, M.D., Managing Director of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, addressed the 1950 session of the Kentucky State Medical Association at Louisville, September 26, 1950. He talked on "Trends and Opportunities in Industrial Medicine." Following DR. HOLMBLAD'S talk, there was a luncheon in his honor at the Brown Hotel, given by GRADIE R. ROWNTREE, M.D., Chairman of the Section on Industrial Medicine and Surgery.

RUTHERFORD T. JOHNSTONE, M.D., gave two addresses at the Annual Fall Conference of the Southwest Louisiana Graduate Medical Assembly at Lake Charles, Louisiana, September 15 and 16, 1950. He spoke on "Diagnosis of the Occupational Diseases," and "The Effect of Industrial Gases and Solvents."

JAMES H. STERNER, M.D., Chairman of the American Medical Association's Committee on Health Hazards, addressed a meeting sponsored by the National Noise Abatement Council and Armour Research Foundation at the Illinois Institute of Technology, October 20, 1950. His subject was "Are We Ready for Standards in Noise?"

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63rd Annual Meeting, April 3-5, 1951, at the Drake Hotel, Chicago

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THE TENTH International Congress on Industrial Medicine will be held in Lisbon, Portugal, September 9-15, 1951.

THE Annual Meeting of the TERRITORIAL ASSOCIATION OF PLANTATION PHYSICIANS is being held November 9-12, 1950, at Lihue, Kauai.

THE Institute of Industrial Health of the University of Cincinnati will accept applications for a limited number of Fellowships which are being offered to qualified candidates who wish to pursue a graduate course of instruction which will qualify them for the practice of industrial medicine. Candidates who complete satisfactorily the course of study will be awarded the degree Doctor of Industrial Medicine. Any registered physician, who is a graduate of a Class A medical school and who has completed satisfactorily two years of residency (including internship) in a hospital accredited by the American Medical Association may apply for a Fellowship in the Institute of Industrial Health. The course of instruction consists of a two-year period of intense preliminary training in the basic phases of Industrial Medicine followed by one year of practical experience under adequate supervision in industry. During the first two years, the stipends for the Fellowships vary from $2,100 to $3,000. In the third year the candidate will be compensated for his service by the industry in which he is completing his training. Information can be obtained from the Institute of Industrial Medicine, College of Medicine, Cincinnati 19, Ohio.

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American Conference of Governmental Industrial Hygienists, U. S. Public Health Service, Washington, D. C. J. J. BLOOMFIELD, Secy-Treas. April 22-24, 1951, Atlantic City

American Industrial Hygiene Association 4400 Fifth Ave., Pittsburgh 13, Pa HENRY F. SMYTH, JR., Executive Secy. April 23-26, 1951, Atlantic City.

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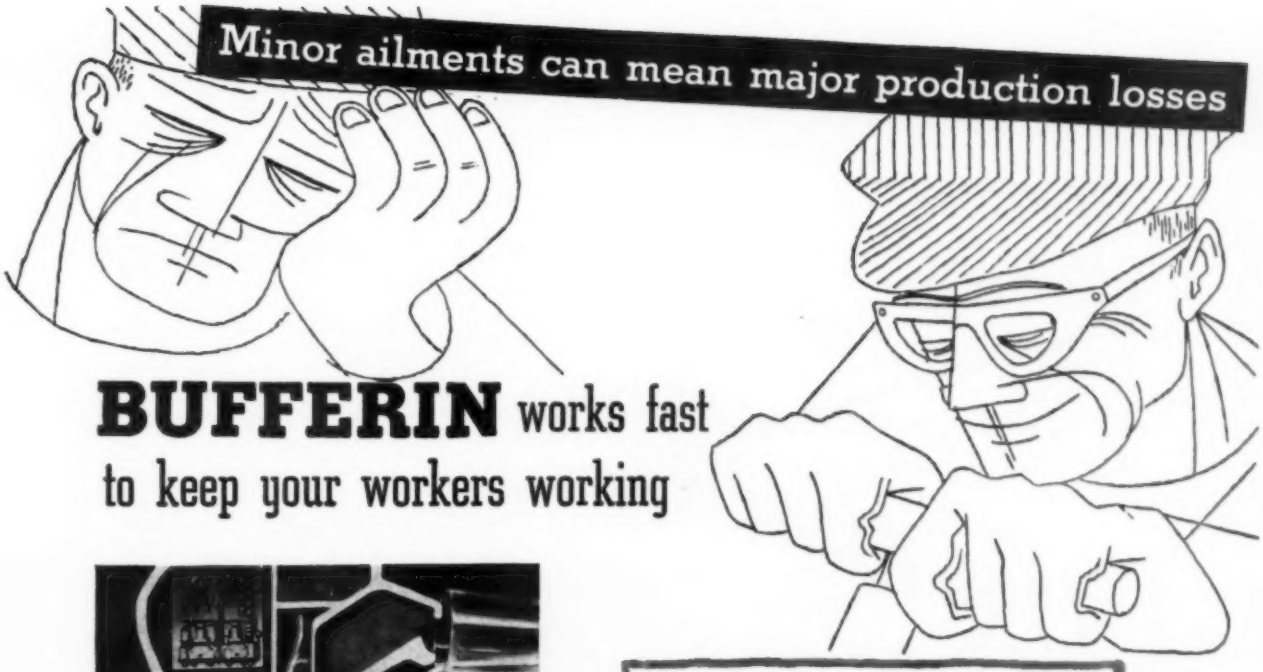

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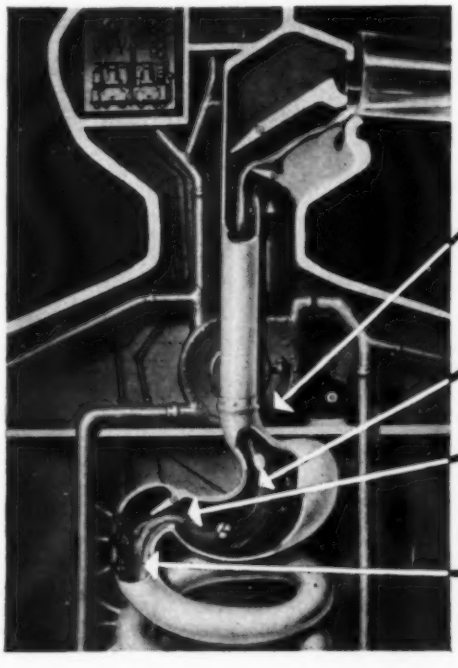

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1. Effect of Buffering Agents on Absorption of Acetylsalicylic Acid. J. Am. Pharm. A., Sc. Ed. 39:21, Jan. 1950.

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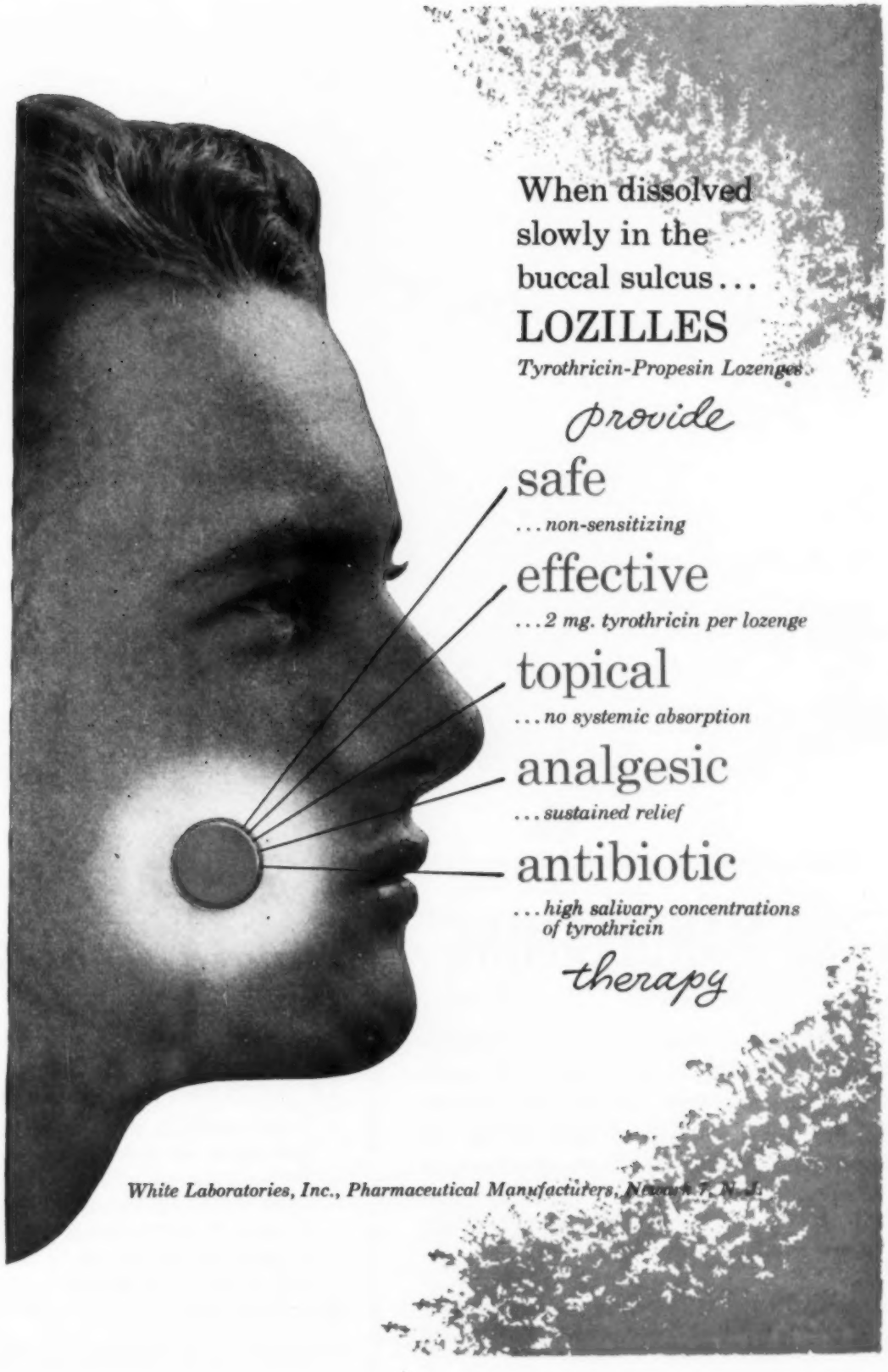
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1. Scudi, J. V., and Reinhard, J. F.: J. Lab. & Clin. Med. 33: 1304 (1948). 2. Carroll, G., and Allen, N. H.: J. Urol. 55: 674 (1946). 3. Simons, I.: J. Urol. 62: 595 (1949). 4. Butt, A. J.: J. Florida M. A. 35: 430 (1949). 5. Merricks, J. W.: West Virginia M. J.: 44: 157 (1948).

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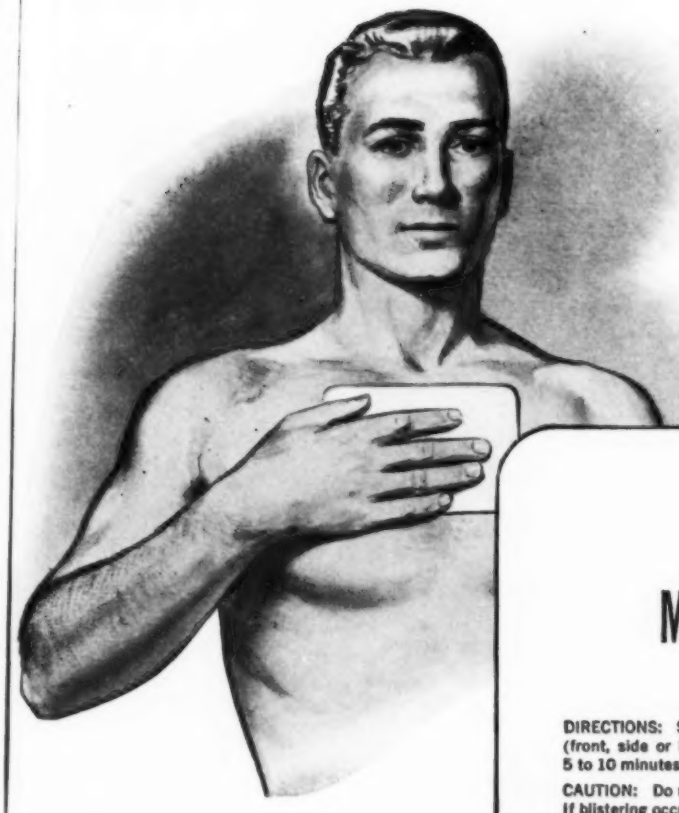

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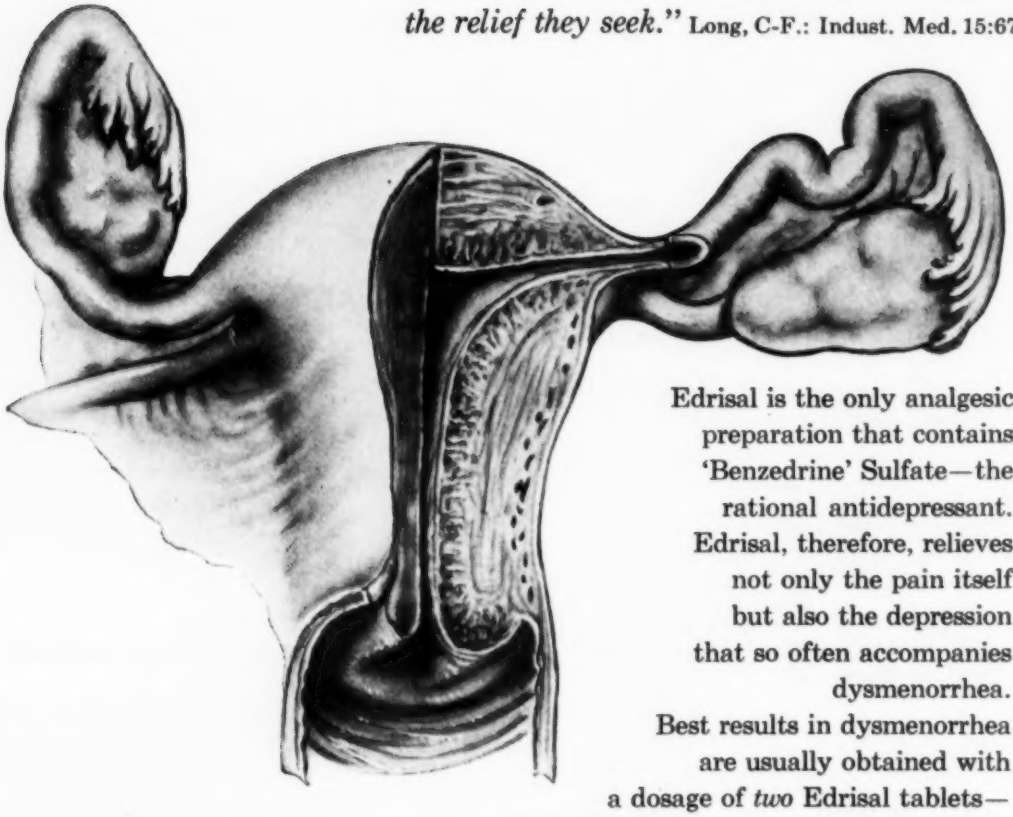

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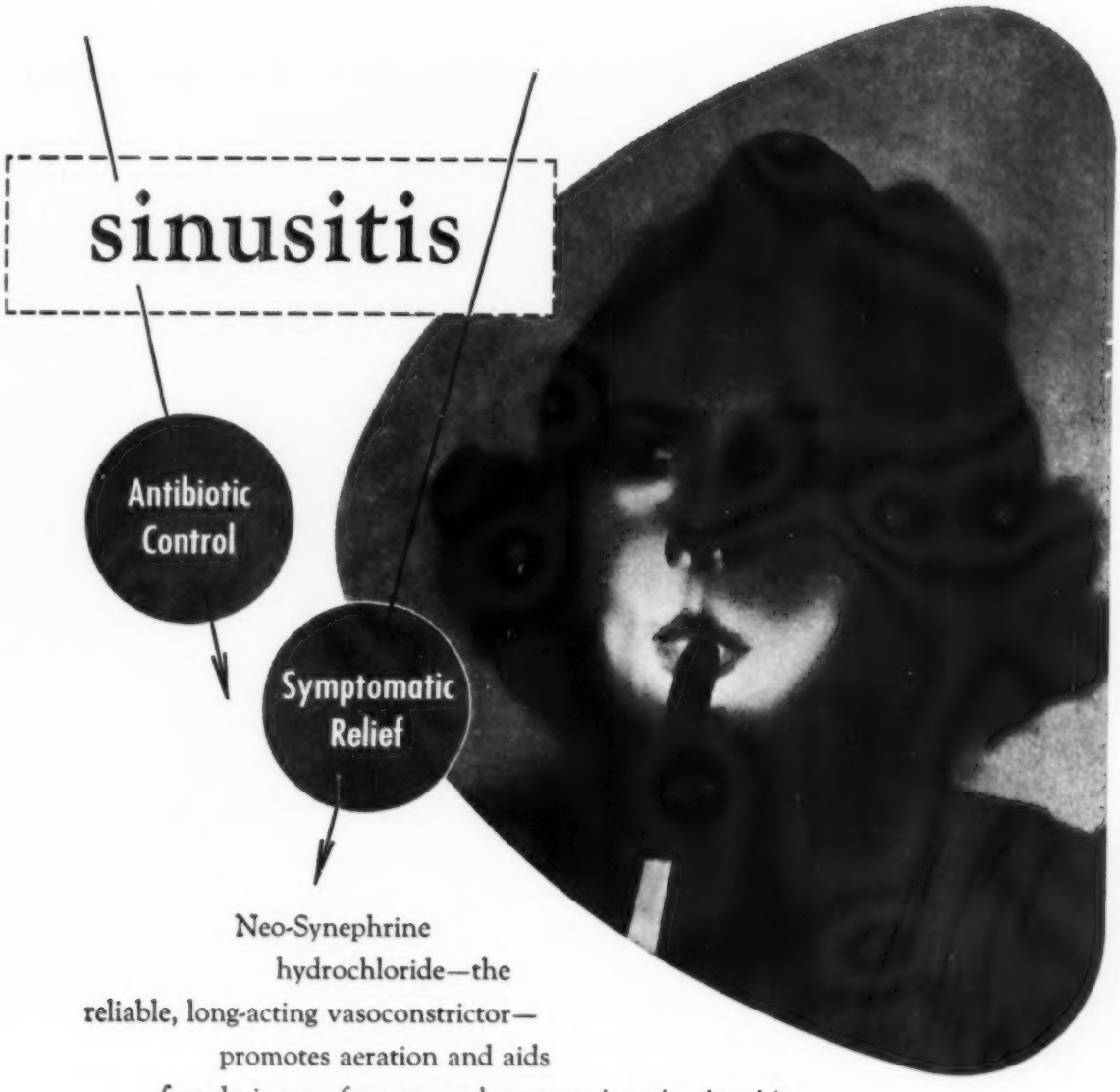

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Once in a long while a remedy is evolved which meets practically all of the medical requisites: effective, safe, and reliable. In the management of peptic ulcer or hyperacidic conditions, GELUSIL* 'Warner' by combining comparatively non-reactive aluminum hydroxide gel with magnesium trisilicate, provides the advantages of both.

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TABLETS—each containing magnesium trisilicate, 0.5 Gm (7.5 grains) and dried aluminum hydroxide gel, 0.25 Gm (4 grains): boxes of 50 and 100, and bottles of 1000 tablets.

LIQUID—magnesium trisilicate, 0.5 Gm (7.5 grains) and aluminum hydroxide, 0.25 Gm (4 grains) per 4 cc (1 teaspoonful): bottles of 6 and 12 fluidounces.

[1]Seley, S. A.: Medical Management of Pyloric Obstruction Resulting from Peptic Ulcer, *Am. J. Dig. Dis., 13*:238, 1946.

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In 1937, for example, we pioneered the introduction of new non-irritating ingredients into our adhesive mass, which reduced skin irritation to a minimum. We then commissioned the dermatology department of a well-known university to make a thorough study of our own and other leading brands of adhesive, with reference to skin irritation. The findings then were that *Curity* Adhesive caused significantly less skin irritation than other brands tested.

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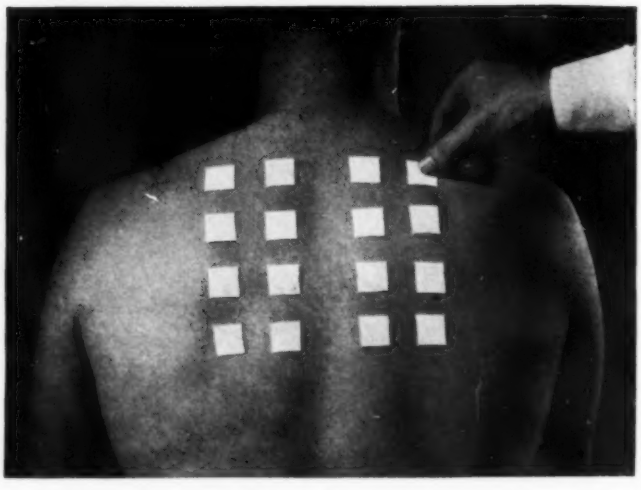

Copies of the findings, in digest form, are available to any member of the medical profession on request.

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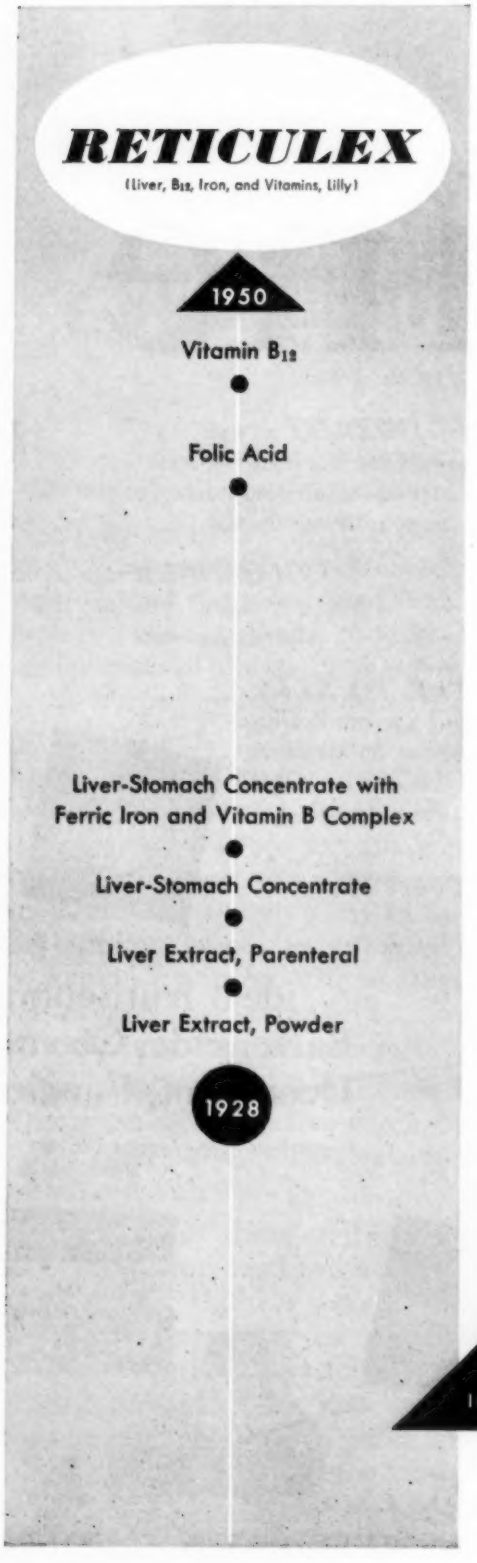

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INDUSTRIAL MEDICINE AND SURGERY
The Journal of Medicine in Industry
With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery"

Volume 19 NOVEMBER 1950 *Number 11*

CARDIOLOGY

Routine Electrocardiography in Industry

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Knoxville, Tennessee

THE taking of routine electrocardiograms on employed personnel in industry has not been widely advocated for obvious reasons: (1) the questionable value from the standpoint of practicability, and (2) the expense involved. In view of the fact that few such surveys have been reported,[1] it was felt that a contribution to the literature on this subject would be worth while, not only in studying electrocardiograms on individual workers but in comparing their electrocardiograms from year to year.

The present study consisted of taking routine electrocardiograms in 1947 and 1948, approximately one year apart, on 342 employees, most of whom were above the age of 40.

Technique and Procedure

ALL electrocardiograms were taken with the patient in the supine position, in as quiet an environment as possible. Technique and application of electrodes, and the position of the electrodes over the precordium were according to accepted standards given in the "Nomenclature and Criteria for Diagnosis of Diseases of the Heart,"[2] and followed standard procedures in the cardiology literature. In 1947, only the standard limb leads were taken routinely. In 1948, the standard limb leads were used along with the precordial leads, V-1, V-2, V-4 and V-6.

TABLE I.
ELECTROCARDIOGRAM FINDINGS FOR 1947
BY AGE GROUPS AND SEX

	Male	Female	Total	Per cent
Normal (including borderline grams)				
Under 40	10	0	10	
40 and Over	286	17	303	
Total	296	17	313	91.5
Abnormal				
Under 40	2	1	3	
40 and Over	21	5	26	
Total	23	6	29	8.5
Aggregate	319	23	342	

All papers in the Cardiology Section (pp. 503 to 533), except that of DR. OVERHOLT, were presented at a Meeting of the NEW ENGLAND CONFERENCE OF INDUSTRIAL PHYSICIANS AND SURGEONS.

Discussion

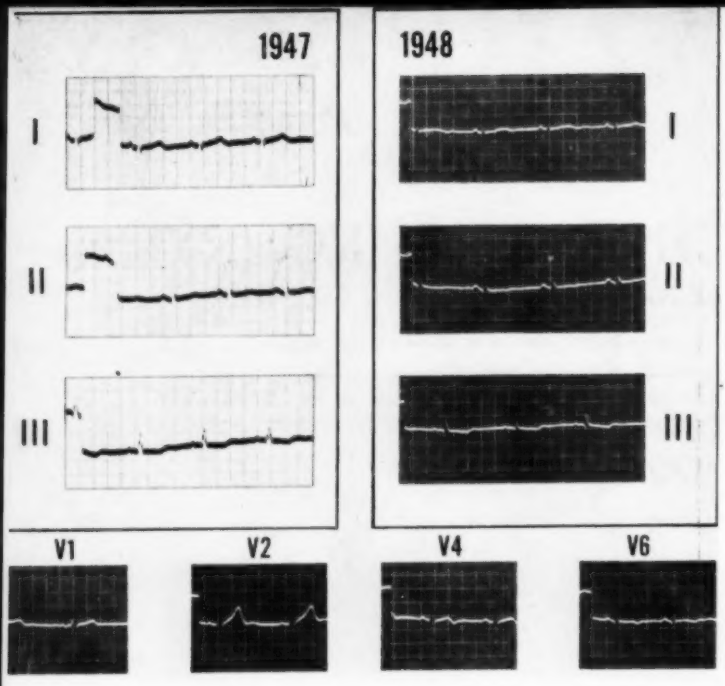
IN 342 employees, 29, or 8.5%, had abnormal electrocardiograms in 1947. In 1948, 34, or 9.9%, abnormal grams were found, indicating that with the aging process of one year there had been an increase in abnormal electrocardiograms of approximately 1.4%. (See Tables I and II.) Table III lists the electrocardiograph findings for 342 individuals. Improvement in electrocardiograms in the 1948 series over the 1947 series was noted in only two instances. In one case there had been a conversion of T-waves from isoelectric or inverted position in 1947 to upright in 1948. (See Case IV.) In another instance incomplete bundle branch block was noted in 1947, but in 1948 the QRS interval had returned to normal limits. (See Case VIII.)

Groups and Cases

ONE of the most interesting correlations was the percentage of abnormal electrocardiograms in relation to personnel being over-weight, with or without hypertension. Clinically, it is a well established observation that patients who are over-weight, with and without hypertension, have less life expectancy and are more likely to develop degenerative vascular lesions. In this survey, Table V shows that the percentage of abnormal electrocardiograms rose in direct proportion to the patient's over-weight and hypertension status. For example—considering the male workers, 4.6% abnormal electrocardiograms

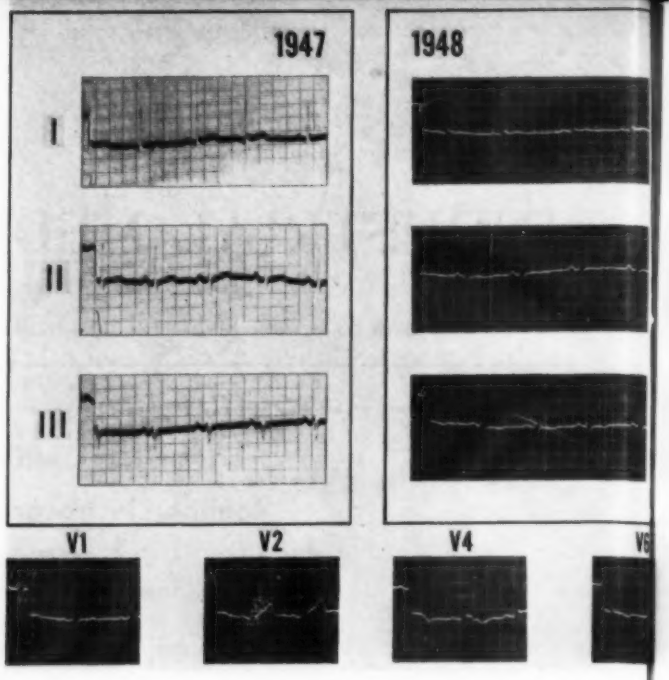
TABLE II.
ELECTROCARDIOGRAM FINDINGS FOR 1948
BY AGE GROUPS AND SEX

	Male	Female	Total	Per cent
Normal (including borderline grams)				
Under 40	9	0	9	
40 and Over	282	17	299	
Total	291	17	308	90.1
Abnormal				
Under 40	2	1	3	
40 and Over	26	5	31	
Total	28	6	34	9.9
Aggregate	319	23	342	



Case I (Above)

Abstract: Employee 51 years old, white male, 5 feet 6 inches tall, weighing 175 pounds, with a hypertension of seven years duration. In 1947 and 1948 he had a diastolic hypertension of 120 or above, consistently. Routine laboratory procedures, including blood count, urinalysis and serological test, were all within normal limits. X-ray of the heart for size revealed no evidence of enlargement but there was some prominence of the aortic knob. Electrocardiogram in 1948 showed inversion of T-2, whereas in 1947, T-2 had been low voltage upright.

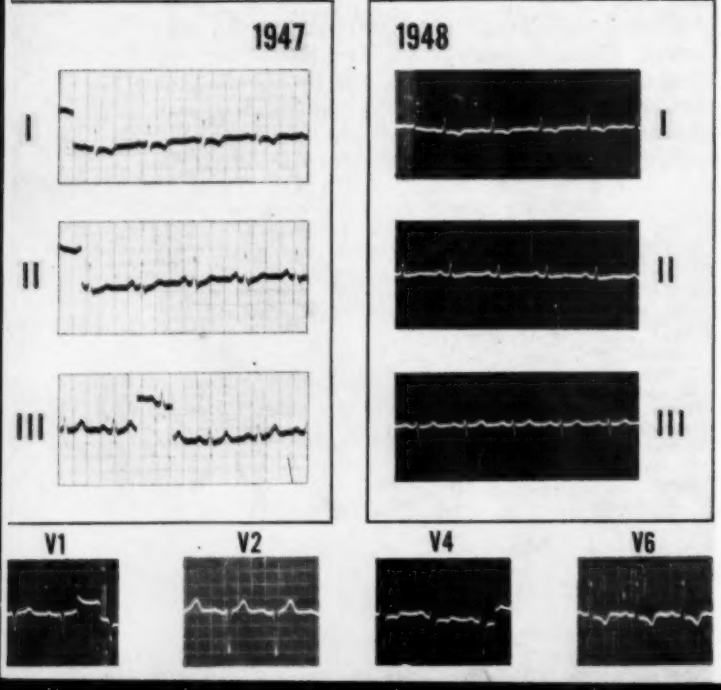


Case II (Above)

Abstract: Employee 60 years old, colored male, 5 feet 11 inches tall, weighing 180 pounds. Laboratory examinations were within normal limits excepting a positive serology. X-ray examination showed normal heart size. Routine physical examination was negative with the exception of moderate sclerosis of the peripheral vessels. Employee was asymptomatic. Electrocardiogram in 1947 revealed a left axis deviation. In 1948 the electrocardiogram showed inversion of the T-wave in leads 2 and 3, and flattening of T-1, whereas the electrocardiogram in 1947 revealed an upright T-1 and T-2. During the period of 1947 and 1948, no illness was demonstrated clinically that could account for these changes.

Case III (Below)

Abstract: Employee 48 years old, white male, 5 feet 10 inches tall, weighing 181 pounds, with a persistent diastolic pressure of 128 and above, with recordings as high as 170 diastolic. He had had a known hypertension of at least 10 years duration. This case is presented merely to demonstrate that certain severe hypertensive individuals are able to carry on in industry. Electrocardiograms for 1947 and 1948 were essentially the same.



Case IV (Below)

Abstract: Employee 48 years old, colored male, 5 feet 11 inches tall, weighing 256 pounds. Routine physical examination revealed no unusual findings except obesity. Laboratory examinations, including complete blood count, urinalysis and serological test, were all within normal limits. This employee was apparently asymptomatic during the period of 1947 and 1948 inclusive. Electrocardiogram in 1947 showed inversion of the T-wave in the standard limb leads. In 1948 T-1 and T-2 were upright, low voltage. No pathological finding could be demonstrated to account for this change.

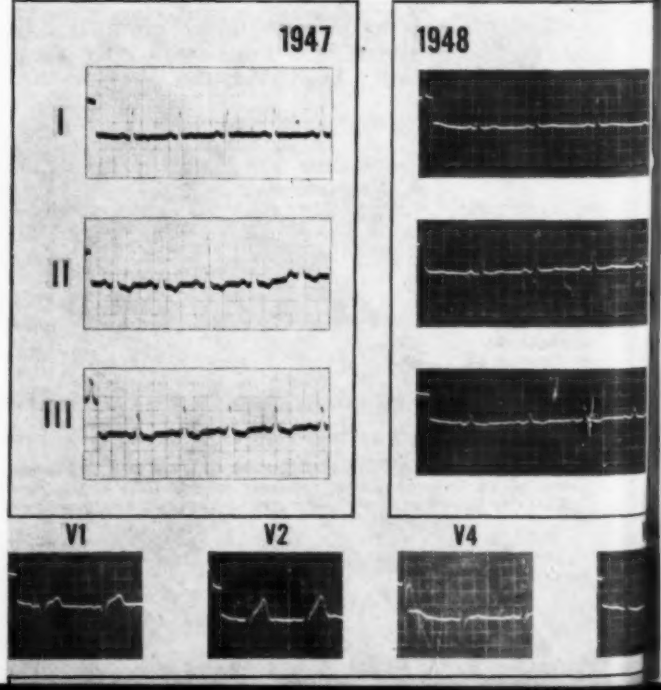


TABLE III.
ELECTROCARDIOGRAM FINDINGS FOR 342 INDIVIDUALS

Finding	First Examination 1947 No.	First Examination 1947 % of 342	Second Examination 1948 No.	Second Examination 1948 % of 342
Incomplete AV Block without Dropped Beats	3	0.9	3	0.9
Complete AV Block	1	0.3	1	0.3
Left Bundle Branch Block	1	0.3	1	0.3
Right Bundle Branch Block	4	1.2	4	1.2
Bundle Branch Block, Partial	3	0.9	2	0.6
Left Deviation of Electrical Axis	54	15.8	58	17.0
Right Deviation of Electrical Axis	4	1.2	4	1.2
Low Voltage of QRS Group	16	4.7	17	5.0
QRS Group Slurred, Notched or Splintered in Leads One and Two	23	6.7	23	6.7
Unusual Elevation at Origin (S-T or R-T Segment)	1	0.3	1	0.3
Abnormalities of T-waves	22	6.4	24	6.5
Others	210	62.3	204	60.0
Total	342		342	

were found in individuals having normal weight and blood pressure. In the over-weight, 10% had abnormal electrocardiograms. In the hypertensive group, 19% had abnormal electrocardiograms while 33% of those with over-weight and hypertension had abnormal electrocardiograms.

Case Reports

CASE I. This employee was able to work all through 1947 and 1948 without any serious difficulty, although his diastolic blood pressure ranged consistently in the neighborhood of 120. In February, 1947, he had a mild upper respiratory infection which responded to local treatment, but he did not lose any time. In 1948, he had treatments for osteoarthritis of the left knee, and in November, 1948 was absent one day owing to a nasal hemorrhage. Using the standard limb leads and comparing them, it will be seen that this individual developed inversion of T-2 in 1948, where in 1947 T-2 had been upright. Unfortunately, precordial electrocardiograms were not done in 1947 so no comparison can be made, but in the electrocardiogram of 1948, there was inversion and coving of the T-wave in V-4 and V-6. The electrocardiogram in this case was the only evidence, either clinical or from the laboratory standpoint, showing progressive myocardial disease. (Hypertensive-Obesity Group.)

CASE II represents an apparently healthy person, age 58, who in 1947 and 1948 had had no illness and had lost no time from work. The electrocardiogram in 1947 showed a left axis deviation but in 1948 the T-waves in lead I were definitely lower voltage and the T-waves in leads II and III were inverted. Over the precordial positions the T-waves in V-4 and V-6 were inverted, indicating probably myocardial changes which had taken place during the period of one year, and which warranted a further clinical check even though the patient complained of no illness. Here, again, the electrocardiogram presented the only presumptive evidence of progressive myocardial disease. (Non-Hypertensive Group.)

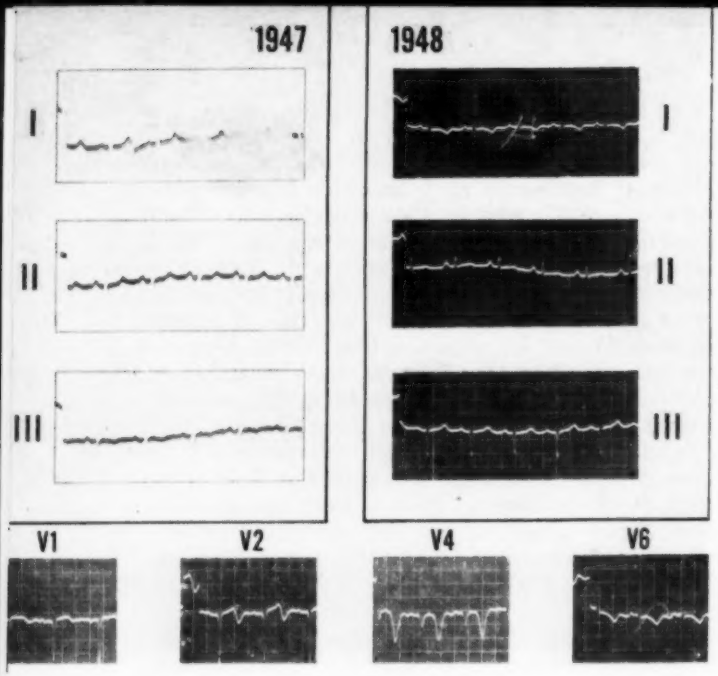
CASE III was that of a rather severe hypertensive worker who had had high blood pressure for many years, with a diastolic pressure that had never been found lower than 128 and had been registered as high as 170. This man was able to maintain his occupation without discomfort, and no unusual electrocardiographic changes were observed between 1947 and 1948. (Hypertensive-Obesity Group.)

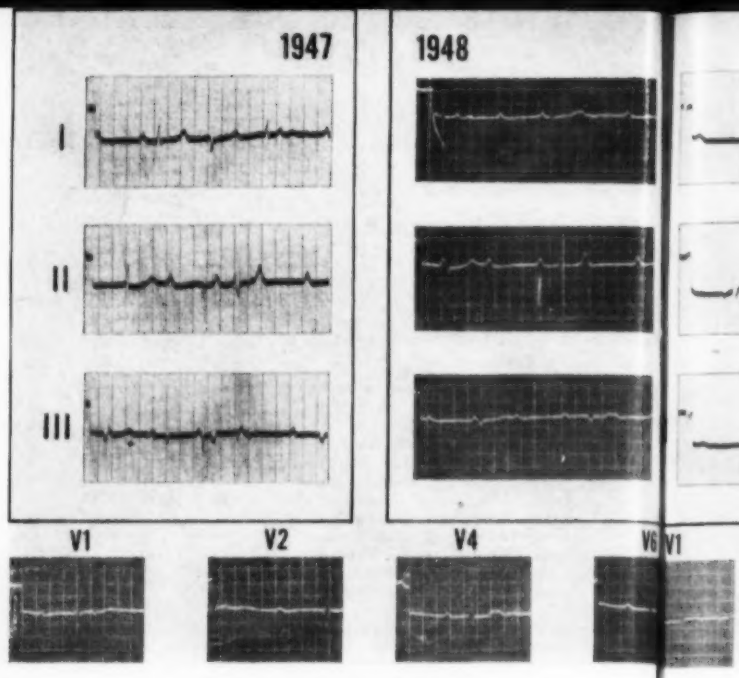
CASE IV represents an individual who was apparently well and healthy all through 1947 and 1948, who had lost no time from work. The electrocardiogram in 1947 showed an inversion of the T-wave in the three standard limb leads, while in 1948, the electrocardiogram showed T-waves in lead I and II to be upright and the T-wave in lead III to be diphasic. This again demonstrates the value of electrocardiography in industry. Routine electrocardiograms taken on an apparently healthy individual who was working continually and who had lost no time, showed evidence of myocardial changes. (Non-Hypertensive Group.)

CASE V represented an employee with hypertension of long standing, with a diastolic pressure ranging between 110 and 120. The electrocardiogram in 1947 showed a mild left axis deviation but otherwise nothing unusual. However, the electrocardiogram taken one year later revealed marked changes. T-1, V-2, V-4 and V-6 were inverted. At no time had this

TABLE IV.
TYPES OF MECHANISMS (RHYTHMS) BY AGE GROUPS AND SEX

	Age Groups 20—29 M	F	30—39 M	F	40—49 M	F	50—59 M	F	60—69 M	F	70—up M	F	Total M	F	Grand Total
Normal Sinus	1	0	4	0	123	10	61	4	14	0	1	0	204	14	218
Sinus Tachycardia	0	0	2	0	14	0	1	1	1	0	0	0	18	1	19
Sinus Bradycardia	0	0	0	0	15	1	8	0	5	0	0	0	28	1	29
Sinus Arrhythmia	1	0	3	0	34	3	12	1	4	0	0	0	54	4	58
Auricular Premature Systole	0	0	0	0	0	0	5	0	1	0	1	0	7	0	7
AV Nodal Premature Systole	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
AV Nodal Rhythm	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1
Ventricular Premature Systole	0	0	0	0	2	2	4	0	0	0	0	0	6	2	8
Complete AV Block	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Total	2	0	9	1	188	16	93	6	25	0	2	0	319	23	342





Case V (Above)

Abstract: Employee 60 years old, white male, 5 feet 4 inches tall, weighing 135 pounds, had a persistent diastolic pressure above 118 over a period of at least three years. Past history revealed that he had been an anthracite coal miner for nine years. Initially, the history was essentially negative and physical examination revealed only hypertension. X-ray examination for heat size revealed minimal cardiac enlargement, confined mainly to the left ventricle. Routine laboratory procedures were within normal limits. The initial electrocardiogram taken in 1947 demonstrated left axis deviation. The electrocardiogram in 1948 showed marked QRS-T changes. During this period of time the employee was asymptomatic and had not lost any time from work.

Case VI (Above)

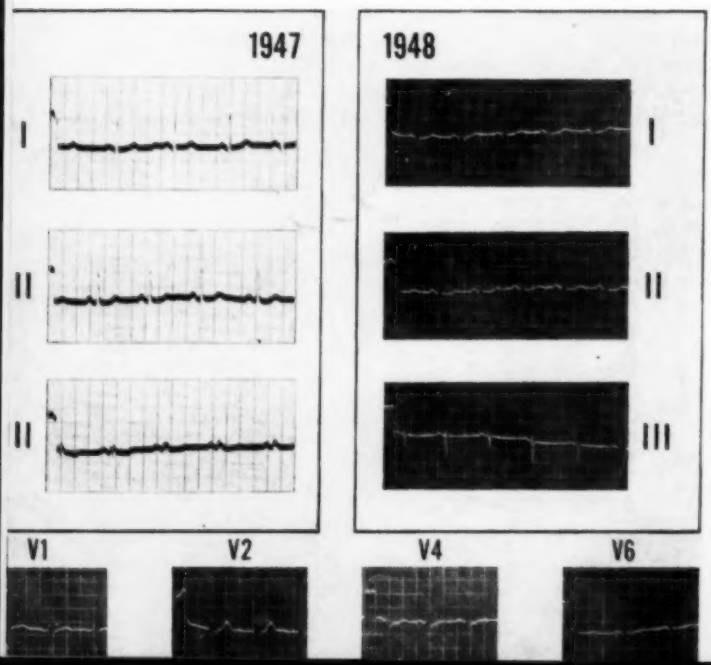
Abstract: Employee 32 years old, white female, 5 feet 2 inches tall, weighing 107, apparently in excellent health. History and physical examination, as well as the laboratory examinations, were all within normal limits. Electrocardiogram revealed a complete heart block. This case is presented merely to demonstrate the known fact that complete heart block per se is not a contra-indication to continue in their usual occupations.

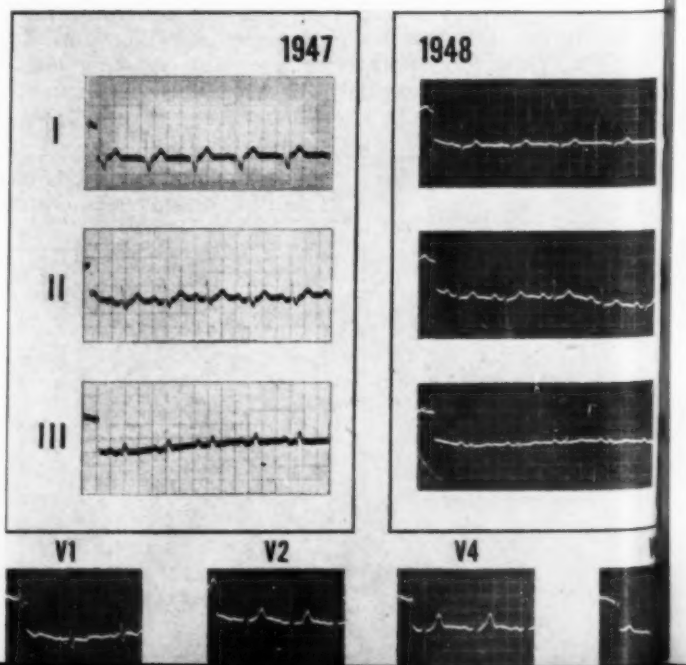
Case VII (Below)

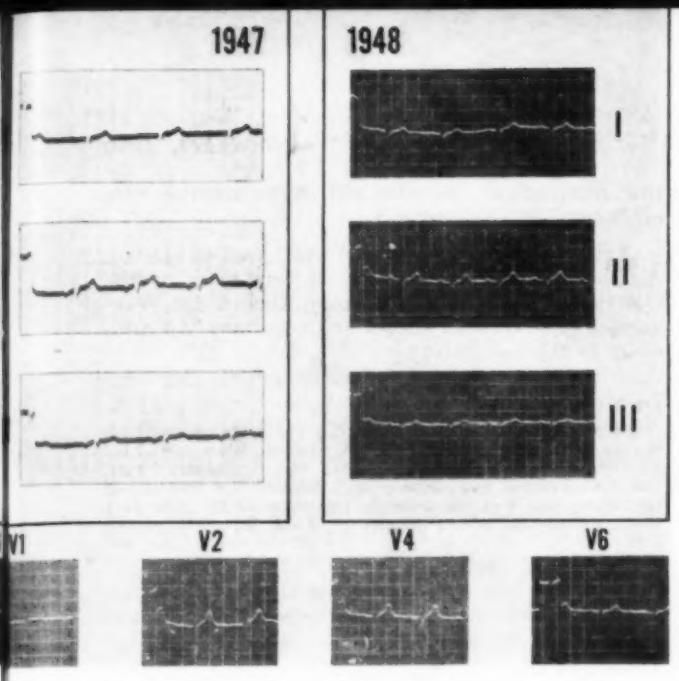
Abstract: Employee 49 years old, white male, 5 feet 10 inches tall, weighing 175 pounds, apparently in excellent health, with the exception of a mild hypertension which, in 1947, ranged between 150 and 160 systolic, and from 96 to 104 diastolic. In 1948 the blood pressures were recorded consistently at above 100 diastolic. History and physical examination otherwise were negative. Laboratory procedures, including urinalysis, complete blood count, serological test and sedimentation rate, were all within normal limits. The electrocardiogram in 1947 showed no axis deviation but in 1948 a rather deep S-wave had developed.

Case VIII (Below)

Abstract: Employee 45 years old, white male, six feet tall, weighing 174 pounds. Blood pressure was recorded at 130 systolic and 90 diastolic. Laboratory examination, including complete blood count, urinalysis, serological test, were all within normal limits. History and physical examination initally were normal. He had a herniorrhaphy in 1947 and a pneumonitis in November, 1948. In 1947, an electrocardiogram showed an incomplete atypical right bundle branch block. In 1948 the QRS interval was normal. Apparently these changes were without significance.







Case IX (Above)

Abstract: Employee 22 years old, white male, 5 feet 8 inches tall, weighing 156 pounds. In 1947 the electrocardiogram showed a nodal rhythm, and in 1948, a regular sinus rhythm. Employee apparently was in excellent health. Physical examination was normal and the only illnesses recorded in 1947 and 1948 were a mild nasopharyngitis and a myositis of the muscles in the lumbar region. This case is presented only to demonstrate one of the types of rhythms that may occur normally.

man had any illness; in other words, he had kept on working and had not reported to the dispensary. In January, 1949, however, he apparently had an acute myocardial infarction and was hospitalized for a period of six weeks by his private physician. Following this attack, he has been able to keep on working on modified activities, supplemented by maintenance doses of digitoxin, mercurial diuretics and a careful dietary regimen.

Many of these people can be made useful citizens and be a great deal happier by working than by being retired to what they term a waiting death. In Case V, the electrocardiogram was the only clue that enabled the medical department to know that this man was having serious cardiovascular difficulties, as he had not reported for any illness or ailment of any type. It well can be seen that by advising this man and shifting him to a job with less manual work, he was able to carry on. If he had been in a position where the lives of many people depended upon his being completely well, this ailment could well have escaped attention, possibly resulting in serious tragedy, had it not been for routine electrocardiograms. (Hypertensive-Obesity Group.)

CASE VI represents a young woman of 32 years of age with complete heart block but with no other symptomatology, and substantiates what has been known for some time, and what has been presented many times in the literature, that young individuals with complete heart block and who show no evidence of any other cardiac disturbance may do extremely well. The main point here is the avoidance of making these people cardiac cripples. (Non-Hypertensive Group.)

CASE VII represents another hypertensive worker who was able to carry on in industry with no complaint, although he had a diastolic pressure consistently over 110. During 1947 and 1948, he had several absences due to upper respiratory tract infections of minor degree. Comparison of electrocardiograms showed that in 1947 the electrocardiogram was within normal limits. In 1948, however, there had developed a deep S-3, lowering of the voltage of the T-wave in lead 2, and a flattening of the T-wave in V-4 and V-6. It may well be that these changes represented a progressive degenerative vascular disease, and this again demonstrates the value of electrocardiography in an individual who was apparently asymptomatic. Electrocardiography was of value here because it enabled the clinician to inaugurate safeguards against any industrial hazard to the employee or fellow workers, and also to advise him on his general health. (Hypertensive-Obesity Group.)

TABLE V.

342 INDIVIDUALS BY AGE GROUPS, SEX, TYPE OF ELECTROCARDIOGRAM FINDING AND OVERWEIGHT AND HYPERTENSION

	Age Groups																					
	20—29		30—39		40—49		50—59		60—69		70—up		Total		Grand	Percent
Finding	N	Ab.	N	Ab.	N	Ab.	N	Ab.	N	Ab.	N	Ab.	N	Ab.	Total	Abnormal
Not overweight or having hypertension																
Male	1	0	3	0	115	4	53	3	15	2	0	0	187	9	196	4.6
Female	0	0	0	1	8	1	1	0	0	0	0	0	9	2	11	18.2
Overweight only																
Male	1	0	3	1	44	4	20	3	3	0	0	0	71	8	79	10.1
Female	0	0	0	0	3	3	3	1	0	0	0	0	6	4	10	40.0
With Hypertension only																
Male	0	0	0	1	12	1	5	2	2	1	2	0	21	5	26	19.2
Female	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Overweight with hypertension																
Male	0	0	1	0	5	3	5	2	1	1	0	0	12	6	18	33.3
Female	0	0	0	0	1	0	1	0	0	0	0	0	2	0	2	
Total																
Male	2	0	7	2	176	12	83	10	21	4	2	0	291	28	319	8.8
Female	0	0	0	1	12	4	5	1	0	0	0	0	17	6	23	26.1

CASE IX is shown merely to demonstrate the various rhythms which may occur in normal individuals without any evidence of heart disease. (AV nodal rhythm in 1947, normal sinus rhythm in 1948.) (Non-Hypertensive Group.)

Summary

ROUTINE electrocardiography in industry can be of definite value in demonstrating cardiac disease not detectable by any other measure, and may be used as a diagnostic adjunct to other laboratory procedures.

2. In this survey, the percentage of abnormal electrocardiograms was directly proportional to the number of over-weight hypertensive employees.

[EDITOR'S NOTE: This survey was based on electrocardiograms taken routinely on employees of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. DR. OVERHOLT serves as Consultant in Cardiology to the Laboratory.]

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1. KLINE, M. W., and HESS, J. H.: The Electrocardiograph in Industrial Medical Practice: A Report Based on 2,000 Electrocardiograms. *Ohio State M. J.*, 43:54. (January) 1947.

2. Nomenclature and Criteria for Diagnosis of Diseases of the Heart, Report of the Criterion Committee of the New York Heart Association, ed. 4. New York, Little & Ives Company, 1939.

"Vastly Encouraging"

CORONARY thrombosis, contrary to popular impression, is not usually fatal immediately or within a short time. Results of a study by Metropolitan Life Insurance Company statisticians show that 70% of a group of persons who had had one or more coronary attacks were still alive at the end of five years, 50% at the end of 10 years, and 43% at the end of 12 years. The study traces survivorship among 540 men for whom life insurance desirability benefits were approved because of heart conditions. Similarly favorable results were shown among those in the experience who were victims of degenerative heart disease, but had no record of an acute coronary episode or other complication. Among these the five-year survivorship rate was 72%, the 10-year rate 50%, and the 12-year rate 44%. Even among cases which had a record of serious kidney or cerebral involvement, the survivorship rate was substantial—40% at the end of five years, and about 17% at the end of 10 years. Among those with valvular heart disease, 44% were alive at the end of five years, and 27% at the end of 10 years. "The results of this study should prove vastly encouraging to many thousands of persons with heart disease, and to their families," the statisticians comment. "A large number of cardiacs can enjoy many years of useful life if they have adequate medical supervision and live within their physical limitations."

—Metropolitan Information Service.

Coronary Heart Disease and the Employee

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IN THE management of coronary heart disease in the employed person, a primary concern of the doctor should be to keep the patient in or return him to such gainful work as his physical state will allow. This is not a visionary ideal or a fantastic notion; it is a proper, sensible and usually feasible goal, for it is now known from the personal experiences of many practitioners and from the extensive studies and writings of Master and others[1-6] that the great majority of patients who have survived acute myocardial infarction are to great advantage employable, and that no apparent ill effects result from work that is judiciously suited to the patient's physical and emotional capacity.

Evidence for these optimistic statements is easily marshalled. In the several decades that have passed since the features of acute occlusion of a coronary artery were first described, and the syndrome has become recognized generally, much has been learned about the natural history of coronary heart disease including its immediate and remote prognosis. Pathologists find that disease of the coronary arteries is astonishingly prevalent, especially among men of middle and advanced age, that it occurs not rarely even among young males,[7,8,16] and that in many of us it may exist for years without any symptoms or signs of its presence. We know that when the disorder does appear the classical expressions are the syndromes of angina pectoris, congestive failure, or acute coronary insufficiency or thrombosis with or without myocardial infarction—or in combinations of these syndromes.

Let us consider first the most alarming and devastating of these syndromes, namely, acute coronary artery thrombosis, and examine the status of this worst group in relation to employability.

That coronary artery disease, particularly acute occlusion, had an alarmingly high early mortality, and that death could at best be eluded only temporarily through a carefully sheltered life of more or less complete invalidism are views that once were widely held but have been, or should be, discarded in the light of modern knowledge. From the extensive observations of cardiologists, such as Paul White[9] and others[10,11,12] we now know that the immediate mortality of acute coronary thrombosis is probably less than 20%, that the majority of cases survive 10 to 25 years or more—a significant figure for the elderly age group concerned—and that survivals for several decades after one or more acute coronary thromboses are no longer considered rare. If one could correct these figures for industrial purposes by excluding from calculation all persons over the conventional retiring age of 65, the statistical outlook would be even brighter, for it is well known that the prospects of long survival are better for the relatively younger group.[11]

Coronary thrombosis is unfortunately common. Master[7] has estimated that close to one million cases occur annually in this country—one in every 30 males and one in every 90 females over 40 years of age; and, since the majority survive a decade or more, the total number of living people who have had coronary thrombosis presumably numbers at least several millions. In view of the evidence that life expectancy following acute coronary thrombosis is fairly good, it becomes apparent that to exclude for years these millions of persons from gainful employment introduces considerations of vast social and economic importance and demands proof that these millions cannot or should not work. However, there exists already a large and growing mass of evidence showing that most of these persons can do useful work for long periods of time and without apparent harm. Almost every physician knows from personal experience that survivors from acute coronary thrombosis frequently return to work, either with or without medical advice and approval, and may live useful and satisfactory lives for years. Women with coronary thrombosis have never been retired routinely from their essential and useful occupation as housekeepers and homemakers, perhaps because their family work does not depend on the labor market or involve compensation laws; the majority have always resumed their housekeeping roles, have performed about as well as before their illness, and apparently have lived just as long as the traditionally more protected male. But there is more scientific statistical evidence that males also may return safely to work after proper convalescence. For example, Master[1,2,13,14] has shown from his large experience with more than a thousand such patients that 90% had returned to full or part-time work, most of them within six months of the acute coronary episode; that the majority remained at work for years with or without some partial disability; and that in general the type of occupation had no deleterious influence on their after-histories as compared with persons who, for one reason or another, did not resume or remain at work. As long as 12 years ago Crain and Missal[4] reported from the Eastman Kodak Company that of 169 actively employed workers with past coronary thrombosis, the majority of whom were more than 50 years old, 38% were asymptomatic, including the 62% who had slight

or moderate limitation of activity because of symptoms, the periods of employment ranging from three to more than 10 years. Think of the great personal and social good that this intelligent employment policy has accomplished! And when one considers that partially or potentially incapacitated employees are often the most grateful, loyal, conscientious, and least demanding workers on the payroll, the benefits to the employer and to industry of such an employment policy are clearly evident. One easily could amplify these statistics with a score or more of similar reports, all testifying to the safe employability of from 50 to 90% of persons with known coronary heart disease; and, significantly, I know of not one contrary report based on facts rather than prejudiced conviction. The true percentages of the potentially employable are probably even higher, for undoubtedly many do not return to work because of lack of jobs, improper medical advice, prejudiced employment regulations, restrictive union practices that will not permit transfer of a patient to another and more suitable category, and the inhibitory effect of so-called disability benefits from insurance or government agencies.

NOW THAT the case for the employability of the victim of past coronary thrombosis has been stated, what can the physician do to get his patient back to work safely and within a reasonable time after the acute illness has been weathered with the benefit of modern medical care?

Perhaps the first step in the rehabilitation of the patient is proper psychological orientation in relation to the disease. An optimistic prognosis is, as we now know, usually permissible to emphasize not only for survival but also for a return to or toward a satisfactory mode of living, in both a social and occupational sense. The terror and hopelessness with which most laymen regard their heart attacks must be mitigated actively by the physician not only to spare the patient from what usually proves to have been needless mental torment, but also to avoid the extreme cardiac neuroses which threaten these patients and which alone may prevent a return to a useful and confident life.

Another essential early step is to inform the employer that the worker will require about three or four months of sick leave for full convalescence; a further extension usually can be arranged later if required because of complications or a more protracted recovery rate.

The convalescence of the patient from the uncomplicated disease usually will require three or four weeks of more or less complete rest, followed by four to six weeks of gradually increasing activity if the patient's condition remains or can be made relatively asymptomatic. It is during this period that the physician can begin to assess his patient's physical capacity in relation to the work requirements, a proper appreciation of which may demand the doctor's acquiring a first-hand acquaintance with the nature and environment of the job, particularly if the work is not sedentary. A personal conference with the plant physician or employer can accomplish a great deal in suiting the job to the patient, if changes are considered desirable. When an essential change in assignment may involve a decline in wages, the patient may be taught to understand that a partial loss of salary for medical prophylactic reasons in the long run may be balanced by lesser economic losses through sickness leave and medical expenses.

Having arranged for what appears to be a suitable work environment, it is desirable to follow up the job placement either personally or through the plant health service both to assure continued observance or further modification of the arrangements as the worker's health course may indicate.

Employees who remain asymptomatic and free from cardiac enlargement or congestive failure almost always can return safely to light or moderate labor and sometimes even to heavy labor.* However, positions that make intense emotional demands, and jobs requiring considerable sustained exertion or brief but violent efforts, are not suitable for patients with angina pectoris or congestive failure, even if mild; and the same attitude should be adopted toward heavy labor for the worker who has made a complete symptomatic, physical and electrocardiographic recovery from coronary thrombosis. The fact that only a small fraction of acute thromboses occurs in close relation to unusual physical effort does not, in my opinion, exclude the importance of this influence in the individual case. The recent reports by Blumgart[15] and by French and Dock[16] comprising more than 100 cases of acute coronary thrombosis occurring in close association with unusual physical or emotional strain, among military personnel less than 36 years of age, argue that we cannot ignore the role of such excessive demands in patients already known to be vulnerable.

In general, one may say that work being performed relatively asymptomatically, or without increase in symptoms beyond those that characterize the person's casual life outside of work, may usually be considered permissible. This generalization does not exclude from properly adjusted work such persons as may have cardiac enlargement, relatively unchanging electrocardiographic abnormalities, mild and easily controlled angina pectoris, or slight congestive failure which is not aggravated by the employee's work. If such aggravation does occur under an optimal therapeutic regimen, a trial of lighter work is indicated before employment is completely denied.

The philosophy underlying this thesis implies a broad-minded and cooperative collaboration

*[EDITOR'S NOTE: The terms *light*, *moderate*, and *heavy*, must be defined for successful and intelligent placement.]

among the patient, the doctor, management, labor, and the workmen's compensation underwriters. Each must be willing to give and to take in reasonable measure, for complete protection for all agencies could be attained only by the absurd and impossible condition of turning the world's work entirely over to young women without hypertension or diabetes, because they are the only adults among whom coronary heart disease is almost unknown.

Unfortunately, the influence of our highly variable workmen's compensation laws, together with the tendency to decide litigation in favor of the injured, are probably largely responsible for the all too prevalent and persistent "hands-off" policy toward the employment of persons with known coronary heart disease. The granting of legal validity to disability waivers, the general inclusion of so-called "second injury" clauses in workmen's compensation laws, and a more enlightened, impartial and realistic basis for expert medical testimony in cases of litigation for presumed injury would do much to encourage the fuller and proper employment of the vast numbers of coronary heart disease patients, with great resultant gains to the individual, to industry, and to society.

Coronary heart disease is not only abundantly with us but undoubtedly will continue to increase in incidence as an ever larger proportion of our population lives on to the age bracket of coronary disease. We *must* adjust our industrial and medical philosophy and practice to meet the problem realistically by preserving the opportunity for work for those who are willing and able to work, rather than adding their enormous burden of unproductivity to the backs of the young and healthy and the already oppressed taxpayer.

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IDENTIFICATION of occupational disease calls for more than the medical knowledge possessed by the private physician, however skillful a diagnostician he may be. It requires, in addition, experience in chemical toxicology, wide and specific acquaintance with the properties of the materials used in particular industries and the potential hazards involved in particular processing methods. In short, it requires the power to make a double diagnosis, first of the worker's pathological condition, then of the potentially dangerous abnormalities of his working environment.

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Acute-Coronary Artery Disease, and Effort

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CORONARY DISEASE is the most frequent type of heart disease. The many cases among the 60 million gainfully employed members of the population make it an important disease for industrial physicians to understand.

With regard to its mode of onset, most physicians agree that at least 95% of cases of coronary occlusion, occur spontaneously. We believe it always occurs this way. The distinction between (1) complete closure of a coronary artery coronary occlusion and (2) coronary insufficiency, must be kept in mind. In the former condition, evidence is lacking that effort plays a part, while in a patient with coronary insufficiency, it appears that effort may precipitate a myocardial infarction.

Some of the evidence with respect to coronary occlusion is as follows:

When the figures have been corrected for age in the groups involved, there seem to be almost identical respective percentages of "workers and laborers," "store, office and business," and "professional" workers among approximately 1,700 patients with coronary occlusion, in comparison with similar groupings in the general labor force in the New York area.

Studies of the activity of patients at the time of onset of symptoms showed that 52% were either sleeping or resting, 22% were performing some mild activity, 9% were engaged in moderate activity, 15% were walking, and less than 2% were involved in some unusual strain. The possible relationship of the most recent activity to coronary occlusion is clouded by the opinion of pathologists that it probably takes hours or days for a coronary occlusion to develop.

Study of the time of day at which symptoms were noted shows an equal occurrence during the day and during the night. Despite popular opinion, no correlation has been observed between the occurrence of coronary occlusions and the time of year, there being no greater number of cases in the winter months than in the summer months.

With regard to the mechanism of occlusion, it has been suggested that high blood pressure, from physical effort or some other cause, could produce intimal hemorrhage in a coronary artery, and that this hemorrhage might serve as the focus for the development of a thrombus causing occlusion of a vessel. Although 84% of a group of hypertensive patients who died after coronary occlusion were shown to have had intimal hemorrhage associated with the occlusion, 95% of the non-hypertensive group showed this. In 25 patients who developed acute coronary occlusion while bedridden for some other cause, post mortem examination revealed an incidence of 61% intimal hemorrhage, which is almost identical with that found in the entire series of 100 patients who died of coronary occlusion and came to autopsy examination; the percentage of intimal hemorrhage in this entire group was 58. Altogether, then, increased blood pressure alone cannot be shown to be a significant factor in the pathogenesis of this disease.

In contrast to the above conclusions, a significant relationship can be shown between effort or strain and myocardial infarction associated with coronary insufficiency. Thus, of 100 patients with acute coronary insufficiency, 10% had symptoms directly after hemorrhage, 8% after pulmonary embolism, 6% after unusual effort, 3% after tachycardia, 3% after surgical procedure and 2% after excitement. Thus, one-third of the episodes of infarction in patients with coronary insufficiency appear to have been related to an unusual strain on the heart.

Discussion

QUESTION: I am the examining physician for a rapid transit system, and I have made it a policy not to return any streetcar employee, bus operator, or train motorman to this type of work, following his recovery from a known coronary occlusion with cardiac infarction. I return such employees to other forms of occupation. Am I wrong? And if so, what criteria should I use to allow their return?

DR. MASTER: I think, in general, you are right. However, you must individualize. I am reminded of an example. In 1936 I saw a young executive of General Motors, who was 32 years old. He had an electrocardiogram specific for coronary occlusion, and ran a characteristic clinical course. He made a fine recovery, as young people often do. His resting electrocardiogram and his two step exercise electrocardiograms were normal within a year. We saw him regularly, twice a year thereafter, and in all tests he was always normal. In 1943 I met him in the Solomons, he was flying for the Navy!

Rheumatic Heart Disease and Employment

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DESPITE an incomplete knowledge of the epidemiology of rheumatic fever, the full impact of its significance as a public health problem, particularly as it affects those in the industrial groups, is recognized by all. Paul's[1] recent monograph places the incidence of rheumatic heart disease in our present day population as over 840,000—and Martin,[2] more recently, indicates that approximately 1,000,000 is more nearly correct. Again, the experience in the examination of men between the ages of 21-36 under the selective service system in World War II disclosed over 50,000 cases of rheumatic heart disease. Since the incidence of rheumatic heart disease in the female adult population is slightly higher than in the male, it is obvious that a formidable number of employable persons are suffering from this disease. Most revealing is the fact that in the potential military group referred to, only about one-fourth of those showing clear evidence of rheumatic heart disease could provide a history of previous rheumatic symptoms. It has become increasingly clear, therefore, that reliance upon history alone in pre-employment examinations is inadequate.

In the past few decades there has been a great extension of our knowledge of the clinical nature of rheumatic fever. Despite this great increase in knowledge of the natural history of rheumatic disease and its cardiac manifestations, no clear-cut criteria have been established for the diagnosis of mild carditis, or for the determination of the presence or end of carditis. In children and young adults, there is general agreement that progressive cardiac enlargement is an unfailing sign of acute carditis. Of particular interest to the industrial physician is the concept that a quiescent rheumatic heart will resist dilatation and hypertrophy, whatever the extent of valvular damage. In children, vigorous physical exercises do not appear to increase the size of the quiescent heart. There is agreement on the observation that in rheumatic children and young adults, congestive failure occurs practically only in the presence of acute carditis.

The greater awareness of the insidious development of cardiac injury caused by the rheumatic process and the disclosure of so large a number of our young adult population as victims of this disease indicate the justification for greater study of its epidemiology in order that more practical measures may be formulated for its eventual prevention and control. There is certainly a great need for expanding community resources for the diagnosis, treatment, and rehabilitation of rheumatic persons. There is clear need for further evaluation of the social, economic, and racial selections of rheumatic fever and the effect of geographic location, climate, dampness, crowding, undernutrition, and inherited tendencies. Many cities and states now have active programs relating to rheumatic fever and rheumatic heart disease, and further expansion in this direction may be expected under the impetus of the Helen Hayes Whitney Foundation, and the aggressive attitude of the present council of the American Heart Association.

The association of rheumatic fever with special strains of hemolytic streptococci has been proved amply. Whether these streptococci inflict their damage directly, or through some, as yet unclear, type of allergic response, especially in individuals peculiarly sensitive, has not been established. Of particular importance is the fact that persons with a history of relatively recent recovery from an active rheumatic episode, under conditions of crowded living, when affected by streptococcic respiratory disorders, may exhibit as high as a 50% incidence of recurrence. It is in this group particularly that sulfonamide, and more recently, penicillin prophylaxis, has been so effective in curbing streptococcic infections and thereby has lowered markedly the incidence of recurrence of the rheumatic infection. Peculiarly, these drugs, which are so successful in prophylaxis, exhibit no curative effect once the infection has become active, and are, in fact, contra-indicated during these periods.

Age Groups

A KNOWLEDGE of the natural life history of rheumatic heart disease is essential for the proper evaluation of the affected individual, either in the pre-employment examination, or in the follow-up observation of the employee. In this light, the recently published statistics of Wilson and associates, based upon a 30-year study of 1,042 children, are illuminating. It is apparent that the severe cases of active carditis succumb either early in childhood or at puberty. Of those that reach early adult life, it is strikingly evident that 90% of those in the age group 20-44 are able to carry on normal activity without disabling cardiac symptoms. As stated, morbidity due to rheumatic heart disease is low after puberty—the average annual rate of recurrence after this period being as low as 3%. An affected child has four chances out of five to survive childhood (to age 10), three out of four to survive puberty, and 19 out of 20 to survive early adult life.

The over-all chance to survive to age 40 is one out of two. This may be the proper time to comment upon statistics. It must be emphasized that while statistics are of value in relationship to whole groups, indicating average experiences, it is of utmost importance to judge each case individually. In very few diseases is there such extraordinary individual variation as in rheumatic heart disease. Each person must be judged separately, and proper evaluation of fitness and risk depends upon careful appraisal of all the features exhibited by that person. Most cardiologists are aware of the extraordinary activity and capacities of many patients with rheumatic heart disease who are in late adult life.

From the standpoint of the industrial physician, the employment of the person with known rheumatic heart disease constitutes a complicated problem. The cardiologist is concerned primarily with the interest of the patient—the industrial physician with the interest of both the employee and the employer. Representing the viewpoint of the cardiologist, Sir Thomas Lewis is credited with the statement that "in the ideal state no position in industry which might be filled by a person handicapped with cardiovascular disease should be filled by an entirely healthy individual." I can understand well and sympathize with this undoubtedly strong statement.

As Stroud has pointed out it is difficult to state positively that almost any occupation may not have contributed in some slight degree to the progression of the cardiovascular lesion that has finally ended in heart failure or sudden death. Certainly, until there is more uniformity in the interpretation of workmen's compensation acts by the various referees and courts, it will be a difficult matter to persuade many employers to accept persons handicapped by rheumatic heart disease. Again, it may be emphasized that we are becoming increasingly aware of the fact that in spite of the presence of valvular deformity many individuals can perform the average type of work without impairing materially their health or shortening their life. We recognize that unless an individual has active infection within his heart, or is in a state of borderline failure as evidenced by dyspnea, pulmonary edema, hepatic enlargement, dependent edema—*moderate* physical effort appears to play little part in the progress of the disease or in the production of congestive failure. Certainly most sedentary occupations do not seem to hurt the average adult with rheumatic heart disease.

The interest of the patient calls for the best possible understanding of his condition. A careful appraisal, including accurate history of his functional capacities at rest and under moderate and great effort, is in order. Every effort should be made to determine how recent was the last bout of active rheumatic infection. If recent, adequate technical and laboratory study should supplement the physical examination to exclude persistence of the active carditis. Where possible, electrocardiographic study and a six-foot roentgenogram of the heart are important, in fact, essential requirements for adequate appraisal of the person, his capacity and safety in various kinds of work, and his placement in the most suitable employment.

Re-employability

IT WOULD BE desirable, of course, if we could formulate absolute rules, cross referring from the pathological heart condition to the kind of work permissible. Although convenient, this would be unreliable. The need is for a careful appraisal of all the elements in the individual situation, the nature of the heart lesion, the likelihood of re-infection or supra-imposed infection (such as subacute bacterial endocarditis), the age, body build, general state of health, nervous and mental reactions, training and aptitude of the person. To be considered also are the kind and hours of work, climate and altitude, opportunities for proper nourishment, sleep, recreation, tension at work, and effort involved in getting to and from the place of employment. It may be pointed out that physically handicapped workers, when properly placed, are usually permanent and faithful, since they are grateful for having a job.

On the other hand, the interest of the employer as mediated through the industrial physician calls for efficient and safe work. As Kilgore has pointed out, efficiency is not merely the ability to *do* certain work. Speed, maintained through regular working hours, and freedom from much sickness are required. Safety, which is not just an immunity from syncopal attacks is necessary for machine and transportation workers. Important as that is, it is of less importance in the minds of many employers than is their own immunity from penalties under the industrial accident laws. Again, as Kilgore has emphasized, a competent machinist with mitral stenosis may be crippled rather suddenly by the onset of auricular fibrillation (an arrhythmia which develops in approximately 50% of cases of rheumatic heart disease with mitral stenosis). The chances are that an ordinary act in his work will be blamed for it, that medical testimony will be found to support his claim, and that the man then will retire for an indefinite time at the expense of the employer, or insurance company. This may be desirable for that particular machinist, but hard on the next employment applicant with mitral stenosis. That next applicant may be physically and otherwise well-qualified for the job he seeks. He may even be eager to assume all risk incident to his disease, but it is doubtful, in effect, if his signed waiver would protect his employer. After all, the employer who protects himself by insurance also knows that eventually more injuries will bring higher premiums. We cardiologists find, there-

fore, that the placement of the rheumatic heart disease patient requires the persistent solicitation of the employer.

Where the policies of the employer permit the employment of the selected person handicapped by rheumatic heart disease, certain factors other than those already commented upon are of paramount importance—to both the cardiologist and the industrial physician. Proper selection is based primarily upon the prognosis of the individual case. The only sound basis of prognosis is actual experience, and theoretical considerations never should be allowed to weigh too heavily against this. The simple fact that there is a heavy mortality in patients suffering from certain forms of valve disease helps us little, if at all, in advising individual patients as to their prospects of living, or capacity for work. A patient having a given grade of aortic or mitral lesion actually may be on the point of death, or may, after a long and active life, reach an advanced age and die of intercurrent disease. How can we proceed satisfactorily to use valve disease in prognosis in the face of such contrasts? It is true that such contrasts are less frequent among those suffering from advanced rather than from slighter grades of aortic valve damage, but this is not altogether relevant, and it is also true that, with the exception of the aortic valve, the grade of lesion usually cannot be estimated accurately during life. The cases with extremely bad and extremely good prospects are there, and between the two is every transitional type. It should be obvious, therefore, that if the future is to be foretold in cases of valvular heart disease with any approach to accuracy, we must look beyond the valves. Help is to be obtained in prognosis from the condition of the valves in some cases; in other cases, not. If the individual is recognized to have congestive heart failure, the valve deformity is so outweighed that it usually can be neglected altogether. Where there is great cardiac enlargement, again this factor is the more important. Failure and enlargement will be the factors determining a reasonable prophecy in these cases. Just insofar as the symptoms and signs of failure and cardiac enlargement are displayed, so the value of the valve lesion recedes into the background.

The presence of a valve defect is chiefly significant in individuals who present few or no other signs of heart disease. Among persons who have outlived for some years the original rheumatic infection, there are many who exhibit aortic regurgitation or mitral stenosis, but who are vigorous, possess excellent myocardial functional capacity, and in whom there are no symptoms and in whom no definite signs of enlargement can be demonstrated. They are usually, but not exclusively, young people, and experience shows that in them the prognosis is good. That is to say, these people usually will live many years and enjoy good health. A few in this uncomplicated group of aortic disease and mitral stenosis, *and only a few*, will develop graver manifestations in a few years. It is most important, however, that this fact should not be allowed to introduce gloom into the prognosis of the group as a whole.

It is probable that the reason why valve disease is significant, is not to be found mainly in the burdens which it imposes upon the heart muscle, but mainly in associated disturbances that come with the valve disease and from a common source. The heart displaying disease of its valves has usually been the seat of an inflammatory process or degenerative change. Disease in the valve is rarely isolated, for it is accompanied by disease in other parts of the heart. Patients with mitral stenosis are more prone than normal people to develop auricular fibrillation and congestive heart failure. Those with aortic stenosis may die suddenly.

Certain features of the isolated valve deformities are deserving of special comment. It is important to remember that mitral stenosis is the most characteristic lesion of rheumatic fever. In mitral stenosis the burden of over-work falls upon the left auricle, the pulmonary vessels, and the right ventricle. Ultimately, if the tricuspid ring dilates, the right auricle also is affected and a rising pressure within the great veins results, which soon causes enlargement of the liver, hydrothorax, ascites, and dependent edema. Dyspnea and fatigue are prominent symptoms. Hemoptysis may be the presenting symptom, and is often alarming and may be confused with pulmonary tuberculosis. Mitral stenosis often is missed unless the patient is examined in recumbency, especially in the left lateral position after moderate exercise. In the presence of auricular fibrillation (which ensues in 50% of adults with mitral stenosis), the characteristic presystolic rumble is usually lost, and diagnosis may depend upon exhibition of an enlarged left auricle. This is demonstrated by the backward bowing of the barium-filled esophagus in fluoroscopy. The configuration of the heart on x-ray examination is usually characteristic. Right axis deviation is usually present in the electrocardiogram. Practically, it is important to remember that in mitral stenosis: 5% develop subacute bacterial endocarditis; 80% die of congestive heart failure; 50% develop auricular fibrillation; 33% of those who develop auricular fibrillation exhibit pulmonary or systemic infarcts.

The majority of patients with mitral stenosis do not survive the fifth decade.

In aortic valve disease one may find isolated aortic regurgitation or aortic insufficiency accompanying aortic stenosis. Aortic stenosis is much more frequent than now diagnosed chiefly because of the misconception that a basal systolic thrill must be palpated. Symptoms (other than heart consciousness, palpitation, etc.) are usually late, and consist chiefly of angina, heart failure, syncope—often with sudden death. Heart failure

is usually of the left ventricular type—acute paroxysmal dyspnea and acute pulmonary edema. Syncope and vertigo may be associated with a hyperactive carotid sinus reflex in these cases, and fainting may last from five to 30 minutes.

The person with predominant mitral valve disease usually exhibits symptoms and signs of pulmonary congestion, gradually develops congestive heart failure, and frequently exhibits auricular fibrillation. In this group sudden death is the exception, and symptoms and signs of impending disaster are adequate to warn the physician that further employment is neither advisable nor safe.

In striking contrast, it may be emphasized again that symptoms cannot be relied upon in the person with isolated or predominant aortic valve disease. Here sudden death is common. In this group, failure tends to come at a later age but is usually progressive once it appears. Again, this is in striking contrast to mitral stenosis where usually there are repeated episodes of congestive cardiac failure and recovery. In the group with aortic valve changes, greater attention should be paid to heart size as determined by fluoroscopy and x-ray film, and less to symptoms.

Conclusions

IT HAS BEEN possible to touch but briefly upon the many important facets of this broad problem. The plea is left for greater leniency for the person with rheumatic heart disease, despite its grave potentialities. A clear understanding of the issues at stake, together with careful cooperation between the cardiologist and other interested groups on the one hand, and the industrial physician and the employer on the other hand, should do much to make full and efficient use of the individual handicapped by rheumatic heart disease.

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One Day at a Time

AN ELDERLY WOMAN with heavy household cares saw the day when she could carry on no longer. The burden became too great. Her strength was waning day by day, and each new day the duties for which she was responsible seemed to mount higher and higher. One day the physician called, and, seeing how little strength she had, told her she would have to give up for a little while, and she became a patient in the hospital. Only then did she realize how exhausted she was. After a few days, she thought of the affairs at home, and became restless. "Doctor," she said, "how long will I have to lie here?" The answer was, "Only one day at a time." That was all he said, but it served to strengthen the virtue of patience in her.

And what lesson do these six magic words teach us? "How long shall I have to pore over books before I can go out and make some money?" "How long shall I have to slave in order that I may provide a livelihood for the family?" "How long shall I have to bend my back to pick and shovel to build highways?" "How long shall I have to stand before the flaming forge to create machinery for the world's work?" It is not a day's work that breaks us, but a week's work, and a month's work, and a year's work—all crowded into one day. The answer to all these questions is the same: "Only one day at a time."

—*The Morton Messenger*, October, 1950.

Occlusive Disease of the Arteries

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THIS CONDITION may be understood better by considering first the physiology of circulation in the extremities. Their arterial bed can, normally, carry different loads of blood at different times depending upon the demand. In the foot, this can vary from as little as 2 cc. to as much as 100 cc. of blood per 100 cc. of foot tissue per minute. A large volume of blood is found either when the body needs to unload excess heat through the skin or when unusual demand is placed upon the extremity as, for example, when an injury or infection is present.

Peripheral arterial diseases may be classified in two groups: vasomotor and organic. Included in the latter are the occlusive diseases such as thrombo-angiitis obliterans, arteriosclerosis and embolism. A patient with one of these types of impairment to the circulation of the extremities may get into serious difficulty from exposure to mechanical injury, heat or cold, followed usually by infection. Physicians as well as patients may precipitate serious conditions by removal of nails, corns, or calluses, or by the use of heat or irritant lotions on extremities with impaired circulation.

Diagnosis of the advanced condition usually is not difficult when one of the cardinal signs is present: absence of pulses, inequality of skin temperature, nutritional changes of skin, or typical late lesions. Treatment of these conditions includes bed rest—frequently in a hospital, gentle handling, avoidance of excessive heat or cold, minimal use of surgery and, when there is infection or necrosis, liberal use of parenteral penicillin. The presence of broken and crusted skin on a leg suggests non-draining infection in an ischemic leg. Attempts at drainage must minimize further trauma. A persistent infection in an ischemic extremity should call for a search for osteomyelitis, which if found and removed may facilitate rapid healing of the entire extremity.

In the prevention of the complications of occlusive vascular diseases, the physician in industry can play an important part by trying to recognize the underlying condition at the earliest possible moment and by recommending or carrying out appropriate study and management. Every employee who receives a complete medical examination should have the state of the circulation of his extremities evaluated by palpation for pulsations of arteries in the wrist, and of the dorsalis pedis and posterior tibial arteries in the foot and ankle. Absence of pulses deserves further study. If a good collateral circulation has developed following occlusion of a vessel, the involved extremity may heal well even though it is injured. Thus, the mere absence of the usual arterial pulsations in the extremities does not necessarily indicate a dangerously inadequate circulatory reserve.

Although the physician in industry would not be likely to have the equipment to carry them out, further tests should be made on persons found to have signs of peripheral vascular disease if their employability were brought into question. These should be done as necessary in the following order:

1. The body temperature should be raised (for example by placing the hands or feet in warm water in a warm room) and the skin temperature of the extremity in question should be measured with thermocouples. (Note that if the foot circulation were to be measured, the hands would be placed in warm water and vice-versa.)

2. In the foot, if the raising of body temperature has not produced reflex vasodilatation, anesthetization of the posterior tibial nerve should be carried out next. If vasodilatation occurs, the measurement of foot skin temperatures with a thermocouple will give an excellent index of the capacity for blood flow.

3. If both these measures fail to produce any vasodilatation (unlikely in all but severe occlusion) appropriate sympathetic ganglia should be infiltrated with procaine, following which skin temperatures of the involved extremity should be measured again.

Once the condition has been evaluated, preventive measures should be recommended or undertaken with an eye to the needs. Patients with thrombo-angiitis obliterans or arteriosclerotic occlusion should avoid smoking. When the feet are involved, properly fitting shoes and socks should be worn, with special emphasis on having both shoes and socks large enough, usually larger than the patient thinks necessary. In cool weather warm clothing and warm footgear should be worn, and dermatophytosis should be given special care since it is a potential danger. Only the mildest fungicides should be used. Toenails should be cut carefully, and only after they have been softened in a bath. All instructions to the patient should be written out and talked over with him. The discussion should be repeated later to clear up the misunderstandings which usually occur.

The employee with peripheral vascular disease should be placed in work which is not likely to aggravate his condition, since he may get along

well for long periods if he can avoid all injury to the extremity. In this connection, it is of interest that intermittent claudication due to insufficient blood supply to the calf muscles usually is not associated with serious impairment of the circulation to the feet. The employee with this condition is handicapped with respect to excessive walking, but may have considerable circulatory capacity in his feet and thus be able to do a job which involves little walking and will require no more than mild exposure of the extremity to heat, cold, or physical injury.

The importance of early recognition, appropriate study, and proper placement in industry of persons with occlusive vascular disease of the extremities is emphasized.

That Backache

BACKACHE, like headache, comes in several different varieties, stemming from many causes and sometimes requiring months to clear up. It is not confined to the industrial worker who does heavy lifting—the housewife or office worker may twist or bend suddenly only to be startled, even rendered unconscious, by a wrenching, sharp pain in the lower back. The normal or even slightly irregular back is usually so flexible that it can perform many movements and a person may live for years without once having experienced the stabbing ache that comes with low back pain. Tripping, however, or twisting suddenly out of a chair may produce the action that leaves the victim in pain for weeks. Low back pain is usually pain in the lumbar, sacral and coccygeal regions, with the last pertaining to the very tip. Because of the variety of causes, long careful study is often necessary to determine definitely the underlying source responsible for the pain. In some instances, the discomfort may be attributed to poor posture alone. The disks between each two vertebrae are designed normally to receive equal pressure when a person stands erect. When improper posture throws the body out of line the disks receive unequal pressure and pain may result. This unequal force is likely to occur low down in the spinal column producing strain in the sacroiliac joint, between the sacrum and the flaring hip bones. Some backaches are traumatic. A sudden or prolonged strain or twisting can dislocate or damage a ligament, throwing the whole hip area out of line, or bursting and squeezing out one of the disks. There may even be chipping or fracture of one of the bony processes of the vertebrae. Other backaches stem from fatigue, a type which is found in persons doing excessively heavy labor. In this group, the pain may come from working in an improper and tiring position which may cause strain on muscles and ligaments. The housewife usually falls into this group, suffering particularly from overtaxed muscles. Then there is the backache which is brought on by nervousness or hysteria. In this type of patient, the physician finds it difficult to clear up the condition because of the persistent complaint that the pain exists, when actually the mental condition is father to the thought, even though tests and repeated examinations disprove the suggestion of infection or injury. Patients with true, organic pain in the lower back region suffer great misery and should consult a physician to ascertain and remedy the cause. Sometimes a few corrective exercises and education in the proper way of walking, sitting or lifting will free the victim of an "aching back."

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The Treatment of Causalgia and Allied Disorders in Employed Persons

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WHEREAS the treatment of true causalgia is gratifying, the treatment of the allied disorders frequently is not. The former is an uncommon disorder and is seen principally in war casualties, while the latter are more common and are more frequently encountered as results of industrial accidents. They are more likely to occur in those persons who have hyperactive sympathetic nervous systems subject to psychological complications.

True causalgia, although of restricted interest to us in the discussion of industrial medicine, is such a definite and clear cut entity that it should be discussed briefly. The clinical picture in causalgia is classical, and the results of treatment are eminently satisfactory. This disorder is associated typically with a partial lesion of a peripheral nerve, usually median or posterior tibial nerves or their trunks of origin. The condition is characterized by a constant, unremitting, severe, burning pain accentuated by certain physical or psychic stimuli which effect principally the sympathetic nervous system. Frequently there are associated trophic and circulatory changes present. The pathogenesis of the disease still is not understood, but it seems likely that it involves a perverted impulse passing over traumatized sensory nerve fibers, produced by stimuli from the sympathetic nervous system. As one can see by the nature of the antecedent injuries, this condition is restricted, in the main, to war casualties and military medicine, where it is seen in 3% to 5% of all injuries to peripheral nerves. These patients are not malingerers, nor are they necessarily neurotic, but the pain is so constant and agonizing that it is totally incapacitating and is a serious drain on the patient's general health.

The pain is best described as burning in character, such as a red hot file rasping the skin. The patient will hold the affected extremity with his good hand, and will permit nothing to touch the hand or foot involved. The extremity frequently is covered with a cold or warm moist cloth, or kept in ice water in order to diminish the pain. Any disagreeable psychic stimuli, particularly those that produce perspiration of the hands or "goose pimples," result in an excruciating aggravation of the pain. Even the mention of certain words such as "slick" or "glassy" or phrases like "squeaky chalk on a blackboard," and such things as looking down from a high elevation, loud noises, or jarring will reproduce an unbearable pain. Later, trophic changes, atrophy, and contractures may occur in the affected extremity as results of disuse because of pain. It is important that proper treatment be instituted promptly in order to avoid these complications.

The treatment consists of interrupting the sympathetic nerve supply to the extremity, proximal to the point of trauma. The relief from procaine blocks of the sympathetics, although temporary, was so dramatic that Leriche and Homans did periarterial sympathectomies with satisfactory results in some cases. More dramatic and consistently successful results, however, are obtained by a central sympathectomy—a dorsal sympathectomy for the arm and hand, and a lumbar procedure for the leg. Procaine blocks always should precede any surgery, because from this the patient and surgeon can get a preview of the operative results. Occasionally one finds patients who have relief of their pain, as a result of procaine block, that outlasts the duration of the anesthetic itself. In these cases, repeated sympathetic blocks are indicated, for even in the presence of severe causalgia, permanent relief may be obtained. However, pain usually recurs one to two hours following the procaine injection and here repeated blocks are useless, and surgery is indicated. More recently, the use of sympatholytic drugs such as tetra-ethyl-ammonium chloride and Priscol® have been tried, and frequently give temporary relief to a variable degree. The effect of these drugs is diffuse and generalized so that the involved extremity does not get maximum effect. At present, their variable side effects and toxicity put an added restriction on their use but in the milder cases their careful employment may be sufficiently effective to give lasting relief and thus obviate surgery.

Disorders allied to causalgia but in many ways typical are by contrast relatively common as a result of industrial injuries. While causalgia itself is not necessarily associated with predisposing psychic factors, the so-called allied disorders are comprised of several clinical entities difficult of differentiation but common in their reaction to stimuli through the sympathetic nervous system where psychic factors play an important and often dominant role.

This group includes those disorders, which following minor, often trivial injuries, have persistent complaints without objective physical signs, as well as those displaying the obvious signs and trophic changes of the reflex dystrophies. Many terms have been used to describe what are often called minor causalgias or causalgic states, such as painful osteoporosis, reflex sympathetic dystrophy, post-traumatic syndrome,

post-traumatic angiospasm, Sudeck's atrophy, or disuse atrophy from pain. The antecedent injury or condition is variable, including such things as minor injuries to soft tissues and bone, pressure palsy of various nerves, vascular occlusions, phlebitis, fractures, burns and as a sequel to surgical procedures and other types of trauma. Related to this group are also those conditions with more obvious physical signs such as digital neuromata, frostbite, and vibration syndrome.

It should not be inferred that disabling disorders do not result in this group of minor causalgias and reflex dystrophies. Indeed, these injuries may be extremely painful and lead to such protection and disuse because of pain, that serious atrophies and contractures may result. It is typical that in the early stage the involved area shows a hyperemia, and later, in the more chronic state, excessive vasomotor activity is seen with cold, clammy skin, and trophic changes to skin and muscles. However, it should be noted that the pain here is not the constant, unremitting, burning pain of causalgia. The noxious physical and psychic stimuli play no role in the aggravation of symptoms. Also, the location of the injury and the symptoms varies from that of a true causalgia. Areas other than those supplied by the median and posterior tibial nerves are involved. These areas are more likely to be those with relatively few pseudomotor and sympathetic fibers, such as the back of the hand, and the proximal areas of the extremities, and even over segmented areas of the trunk. Parenthetically, the importance of whether the nerve involved supplies a functioning surface such as the palm of the hand or the sole of the foot which may be a serious disability, or a non-functioning area such as the dorsum of the hand or the proximal areas of the extremity, need not be stressed to industrial surgeons since the disability attendant upon discomfort from a non-functioning area makes one suspect strongly an associated neurosis. In military neurosurgical centers, symptoms arising from injuries to the cutaneous nerves, other than those supplying the palm of the hand or sole of the foot rarely would prevent a soldier's return to active duty.

There are certain predisposing factors underlying these minor causalgias which help explain the rationale of present day treatment. Even in the absence of any psychic factors or neurotic background, it is felt that there is a definite predisposition to reflex circulatory changes with resultant hypersensitivity to pain, and other symptoms which make up the complex. This predisposition sometimes is described as instability of the autonomic nervous system, or better, as a hyperactive sympathetic nervous system. A more scientific concept is implied in the phrase, "status of basal vascular tone." The effect of this basal vascular tone has been measured by Naide and Sayen,[2] who have determined a particular level for a certain individual by placing him in a constant temperature room at 20° centigrade for 15 minutes. If the temperature of the finger tips remains above that figure, which is an arbitrary point, the patient is placed in that group which is considered as having a low basal vascular tone. In vascular injuries it is found that those patients having a low basal vascular tone do well in forming collateral circulation, and will not require sympathetic surgery, while those having a high basal vascular tone frequently require sympathetic surgery for adequate circulation to the extremity.

This variation in basal vascular tone is real and well known to all of us. It is probably true that most of the patients with the symptom complex of minor causalgias have a high basal vascular tone. This may not be true necessarily with the major causalgias. This high basal vascular tone is also associated with many of our psychosomatic disorders and anxiety states, but increased basal vascular tone does not mean necessarily that the patient is neurotic. An increased basal vascular tone appears to be more common in certain nationalities which may explain much of their leadership in the investigation and treatment of disorders of the sympathetic nervous system.

The physical features of the minor causalgias are surprisingly similar even though the etiologic insult may vary widely. There is exaggerated hypersensitiveness of the skin with hyperesthesia from touch which the patient dreads. Because of fear of contact the patient will protect the area to the extent that he may have incapacity for work. This may go on until the patient develops a true anxiety state. Objectively one may see sweating, signs of vascular spasm, edema, skin changes and later bone atrophy which is attributed to circulatory changes secondary to the vasospasm which was initiated by the pain. However, since the vascular spasm is not constant and these changes are seen in other situations where use of the extremity is restricted, such as in the use of plaster casts, it seems more likely that they are produced from disuse itself. This disuse, which may be precipitated by pain, or encouraged by fear and other psychological factors, and at times may be classified rightfully under compensation neurosis, may go on to the point of producing severe and even permanent contractures. If there is an associated lesion which is likely to produce prolonged incapacity from loss of function, the symptoms from disuse may be increased consciously or subconsciously for added gain. Sometimes, in fact, the trouble may be minor and entirely organic at first, but later, through fear, resentment or "compensation neurosis," the patient may have an hysterical overlay and be refractory to treatment. As stated above, in many cases something basically is at fault with the nervous system of these people. Perhaps it is only an increased basal vascular tone. Some of

the patients suffering from these disorders may be severe neurotics, and some may be stupid or actual malingerers. Particularly when liability or compensation is involved, this symptom complex definitely becomes more common and severe. Here we can heed Homan's warning that it is easy to find fault with patients whose ills we cannot well explain. Despite, or because of, any unconscious psychic factors of possible material gain or fear of loss of security, these allied states of causalgia do cause misery and disability.

The therapy of these disorders allied to true causalgia is difficult but frequently rewarding. Since the symptoms and signs show a definite involvement or overplay of the sympathetic nervous system, whatever the mechanism of the reflex arc may be, many of these patients will respond dramatically to the interruption of the sympathetic nerve supply to that part. Most of the cases, of course, do not come to surgery, responding to physical therapy or psychiatric interviewing either alone or in conjunction with other treatment.

Interruption of the sympathetic reflex arc should be done in a definite and orderly series of procedures beginning with the most conservative step of injecting procaine into the site of the local lesion. This should be followed by a sympathetic ganglion block. If the relief from the procaine interruption of the sympathetics outlasts the duration of the anesthetic, repeated blocks, if necessary, should be done because in these cases prognosis from this alone will be hopeful. If the duration of relief lasts about as long as the anesthetic itself, a good result from surgical intervention of the sympathetics will probably be likely. Patients, whose symptoms are increased by cold, are relieved characteristically by sympathetic interruption. Although as a group, atypical causalgias and reflex dystrophies do not respond so well to sympathectomy as the true causalgias, a satisfactory result may be anticipated if the response to sympathetic ganglion block is dramatic.

Sympathectomies in properly selected cases are useful procedures and cause little discomfort and low morbidity. There is small risk, and hospitalization is brief. The lumbar procedure may be done by most surgeons who have had a little introduction to this type of work; the dorsal sympathectomy for sympathetic denervation of the upper extremity, however, is technically a much more difficult procedure, and although tolerated as well if not better than the lumbar sympathectomy, probably should be done by those specialized in this type of surgery.

The symptoms from digital and amputation neuromata may frequently be relieved by direct surgical attack. In patients not responding to this procedure, but who are given relief by sympathetic ganglion block, a good result may be anticipated from sympathetic surgery. Three illustrative cases are cited briefly:

CASE I: R. D., a young woman, crushed an index finger. Over a period of four years she suffered from burning pain involving the arm and paresthesias, aggravated by exposure to cold. She obtained temporary relief from stellate ganglion block. This was followed by a successful sympathectomy. One month later she reported with symptoms in the shoulder on this side due to a periarthritis from disuse. Two months later she reported with a histamine type of left facial pain. Four months later she was observed to have a severe anxiety state with accompanying hyperhidrosis. One year later she still had discomfort in her shoulder, probably from restricted use, but the original burning pain in her arm was still relieved completely. Her generalized increased basal vascular tone remained unchanged, although she was given satisfactory local relief.

CASE II: D. G. sustained an injury to the left foot when it was struck by a steel beam. He had immediate necrosis of the great toe. He developed some tingling discomfort and marked reflex vascular changes with loss of dorsalis pedis pulsation. Sympathectomy gave rapid relief of symptoms and the restoration of normal pulsation in the dorsalis pedis.

CASE III: This patient sustained an injury to the superficial radial nerve in the course of a surgical procedure. The disability present was only from over-protection because of the resultant paresthesia. There was relief from local procaine block, and only partial relief from burying the neuroma in bone. A sympathectomy was carried out which was notable only for its failure to give lasting relief. In retrospect, it was obvious that the symptoms were not from disuse as a result of pain, but from minor paresthesias in a pain susceptible individual.

The results of sympathectomy are basically two-fold. In the first place this procedure stops the efferent sympathetic stimuli which may be noxious in themselves and produce symptoms from the resultant vasoconstriction and cyanosis. Secondly, this procedure gives a permanent poultice to the involved area by increasing the blood flow through paralysis of the sympathetic nerves. In fact, the leeches and the blisters used during the Civil War similarly gave greatest relief in these conditions.

SUMMARY: Major causalgia is a definite entity requiring the specific treatment of sympathectomy. The conditions allied to causalgia, however, are much more important from the industrial standpoint. They are common, their underlying cause is usually mild, and their mechanism of development through abberations in the sympathetic nervous system is beginning to be understood. The danger from these allied disorders comes from disuse of the extremity with resultant contractures and trophic changes.

Treatment is usually associated one way or another with the interruption of the sympathetic reflex arc and should be carried out by beginning with the simplest procedures in the following order:

1. Physiotherapy with reassurance from an understanding physician.
2. Drugs—sympatholytic agents, mild sedatives, avoiding analgesics and narcotics.
3. Procaine injection locally.
4. Sympathetic ganglion block.
5. Sympathetic surgery should be reserved for the most refractory cases that have a favorable but temporary response to sympathetic ganglion block.

The disability should not be long, whatever the form of treatment used, and should not result in any degree of permanent disability nor be associated with financial gain. The latter would seem only further to cloud and prolong the clinical picture.

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Cancer Detection by Machine

THE USE of electronic calculating machines in detecting early signs of cancer was described by Dr. Gilbert W. King, of Cambridge, Massachusetts, at a recent Seminar on Industrial Computation, sponsored by the International Business Machines Corporation. Dr. King told how standard punched-card computers can identify abnormal substances in urine specimens from suspected patients and how this may be significant in spotting early-stage cancer. Many doctors believe that cancer causes rare hormone-like compounds and other chemicals to appear in the urine. But the problem of finding these cancer "telltales" calls for lengthy and tedious analysis. When a urine sample is exposed to infra-red light or heat waves, some of the invisible rays are absorbed and the rest pass through. The result is an infra-red spectrum, consisting of complex patterns of lines on sensitive photographic film. Each pattern is the "fingerprint" of an unknown substance in the urine, and must be compared with other patterns obtained beforehand from previously analyzed chemical compounds. If two patterns match, line for line, the unknown substance has been identified successfully. Since physicians at the Massachusetts Hospital in Boston have accumulated such patterns for nearly 500 substances that may be significant in spotting early-stage cancer, the matching process may take as much as a week. What Dr. King has done is to code the infra-red spectrum of an unknown substance into holes on a punched-card. Then the card is fed into an IBM computer together with several hundred cards coded to represent the spectra of known substances. Pushing a "start" button sets the machine to work. The computer automatically reads the cards, compares their patterns and stops when the desired match has been made. In preliminary trials, Dr. King has found that the job of identifying possible cancer substances can be completed within a few minutes, which is more than 350 times faster than conventional methods. Computing techniques not only reduce the time for detailed studies, but also make it possible to tackle far more difficult analyses that would not even have been attempted previously, thus clearing the way for new advances in cancer diagnosis.

—International Business Machines Corporation, Release.

Placement of the Employee With Cardiac and Vascular Disease in Industry

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THE PROCEDURES for job placement and health supervision of cardiac and vascular cases in industry must, in most instances, conform to the over-all scheme for handling persons with various types of disabilities. This frequently is the method of necessity and not necessarily of free choice. The decision is determined by several circumstances including specialized qualifications of the plant physicians, time allotted for examinations, and diagnostic facilities. The more highly developed procedures for diagnosing cardiac and vascular conditions, and for determining residual capacity for work, are of indisputable value and should be employed whenever circumstances permit. In many instances, however, the services of cardiologists must be limited to consultation concerning the more serious problems.

The practicable methods of diagnosing disorders through general physical examination, supplemented by specialized procedures in individual cases, plus careful attention to the matching of capacity for work with the demands of the job, are usually satisfactory insofar as the more common physical disorders are concerned. The generally favorable experiences with cardiac and vascular disabled workers placed through such procedures indicate that they are not the exceptions.

The cardiac and vascular disabled persons employed by the Pratt and Whitney Aircraft are evaluated, placed, and followed up in accordance with this general plan. In order to illustrate the procedures, the over-all evaluation and placement program is outlined briefly here. Some of the results of the placement effort in connection with the group as a whole, and the cardiac and vascular cases in particular, are also discussed.

Pre-placement Examination

ALL APPLICANTS who are otherwise found eligible for employment receive a pre-placement physical examination and functional capacity evaluation. The initial examination is rather general in nature. Emphasis is placed upon the medical and occupational histories, vision, hearing, and functional impairments which can be detected through the usual physical examination procedures.

Functional Capacity Evaluation

IN ADDITION to the regular examination, each applicant receives a general functional capacity appraisal. This is done by putting the individual through a series of body motions such as bending, stooping, twisting, etc., and by estimating the amount of strength, or functioning capacity which is left undisturbed by the structural or organic defect that might be present. Effort is made to estimate the approximate percentage of the regular shift time the individual may be expected to engage in the several types of physical activity such as walking, climbing, crawling, lifting, etc., and to encounter exposures to the various hazards to be found in the plant. The final conclusion is recorded in code opposite each factor under consideration with "1" indicating that the man has adequate capacity for such activity or exposure up to but not more than 25% of the shift time; "2," not more than 50%; "3," not more than 75% and "4," indicating that there is some limitation but that he should be able to carry on for at least 75% of the shift time.

The approximate extent or degree to which the individual may be able to exert himself or withstand hazardous exposure without suffering an aggravation of his physical disorder also is recorded in codes, with their most elementary definitions being as follows: "0"—none; "1"—slight; "2"—moderate; "3"—marked; "4"—extreme. "Extreme" as used here is equivalent to saying that the individual is only slightly impaired and is the opposite to "0" which means that he has no useful amount of residual capacity. If no limitation is imposed concerning time, or degree, the space is left blank for the factor under consideration.

Following the general evaluation, the examining physician and the job-placement assistant compare the functional capacity rating, item by item, with the time and degree ratings of the physical demands and hazards of the job for which the applicant is being evaluated. This is an important procedure because the foreman wants to know what the man can do, and under what conditions, rather than what he cannot do, or what the physical defect actually is. In order that the foreman may clearly understand the recommendations, the types of limitations and their extent in regard to time and degree must be given.

This system naturally requires a thorough knowledge of the job demands. In many instances, the examining physician can procure this information through job inspections, but in our plant, we have found it necessary to supplement first-hand knowledge with standard physical demands and hazards data sheets for each job.

The type of information contained on the functional capacity record, and the write-up of the job are illustrated by Figs. 1 and 2. It will be noted that the arrangement of the two forms

is quite similar; thus, direct comparison of human capacity and job demands can be made.

Job Placement

FOLLOWING THE SPECIFIC comparison of functional capacity and job demands, the examining physician summarizes his final conclusions concerning the fitness of the man for the job. These conclusions are abbreviated in a manner understandable by the employment office and the foreman. They may range all the way from "no restrictions for any job in the plant" to "no capacity to do any job in the plant." The conclusion usually falls somewhere between these two extremes and indicates the need for one type of minor job adjustment and/or a "trial of labor" follow-up. Fewer than 1% are found to be physically unfit for any job in the plant, and approximately 60% present no defects of any particular significance in relationship to any type of work in the plant. The remainder fall somewhere between these extremes. Modification of the jobs and follow-up by the zone safety engineers to evaluate job-adjustment experience is necessary in many instances. The value of follow-up of the cases cannot be emphasized too strongly.

Reclassification Examination

REGULAR RECLASSIFICATION examinations are made with the intervals being determined by the type and degree of physical defects, hazardous nature of the jobs, age, skill demands, etc. The scope of the examination also varies to the extent that any special evaluation procedures indicated such as electrocardiograms, blood counts, or determination of lead in the urine, are made in addition to the regular procedures followed in the preplacement examinations. Revised functional capacity evaluations and final conclusions concerning job fitness are given to the foreman in the same manner as they were originally, and they are in effect until the next evaluations are made.

In addition to these periodic procedures, examinations and evaluations are made at any time

FUNCTIONAL CAPACITY RECORD

NAME	DATE	DIVISION	DEPT.	SHIFT	CLOCK NO.
Jones, John	4-14-49	A	1	2	99999

DATE OF BIRTH	SEX	NATIONALITY	MARITAL	TYPE EXAM.	OCCUPATION	JOB CODE
7-3-10	M	Amer.	M	Pre P.	Crib Attend.	700.2

1. BODILY ACTIVITIES	CODES TIME	
WALKING	3	
STANDING	3	
SITTING		
LYING		
	TIME	DEG.
BENDING	3	3
STRETCHING		
TWISTING		
STOOPING	3	3
CLIMBING	2	3
CRAWLING		
PUSHING	2	3
PULLING	2	3
CARRYING	1	3

2. USE OF BODY PARTS		RIGHT TIME	RIGHT DEG.	LEFT TIME	LEFT DEG.
ARM	BENDING				
	TWISTING				
HAND	BENDING				
	TWISTING				
FINGERS	BENDING	3	3		
	TWISTING	3	3		
LEG	BENDING				
	TWISTING				
FOOT	BENDING				
	TWISTING				
NECK	TWISTING	TIME		DEGREE	

3. HEARING	
4. TALKING	

5. VISION		CODES TIME	CODES DEG.
ACUITY	NEAR	3	3
	FAR	3	3
DEPTH PERCEPTION			3
COLOR PERCEPTION			

6. ATMOSPHERIC CONTAMINANTS	CODES TIME	CODES DEG.
DUSTS		
FUMES		
GASES		
MISTS, VAPORS		

7. SKIN HAZARDS	CODES TIME	CODES DEG.
ACIDS-ALKALIS		
FLUXES		
SYNTHETIC RESINS		
PAINTS, THINNERS		
METAL CLEAN SOL.		
CORROSION PREV.		
SOLVENTS, STRIPPERS		
ENGINE FUELS		
SOL. CUTTING OILS		
SOAP & WATER		
INSOL. CUTTING OILS		
LUBRICATING OILS		
BUFFING COMP'DS		
MISCELLANEOUS		

8. PHYSICAL AGENTS AND CONDITIONS	CODES TIME	CODES DEG.
TEMPERATURE HIGH		
LOW		
RAPID CHANGES		
WET QUARTERS		
NOISE		
VIBRATIONS		
RADIATIONS		X

9. ACCIDENT HAZARDS	CODES TIME	CODES DEG.
VEHICLES		3
MOVING MACHINERY		3
HOISTS & LOADS		3
WALKING OBSTRUCTIONS		3
HOLES, PITS, ETC.		
SLIPPERY SURFACES		2
HIGH ELEVATIONS		3
FLYING OBJECTS		
SHARP & ROUGH OBJ.		3

10. LIFTING	USUAL UNIT WT.	USUAL LIFTS PER SHIFT	MAXIMUM UNIT WT.	MAXIMUM LIFTS PER SHIFT	JOINT LIFTING
FLOOR TO BENCH	15	20	25	5	No
KNEE TO BENCH	15	20	25	5	"
BENCH TO SHOULDER	10	20	20	5	"
BENCH TO OVERHEAD	10	20	20	5	"
Bench to Bench	15	25	25	5	"

PERSONAL PROTECTIVE EQUIPMENT

REMARKS Meets job code 700.2

DATE RE-EXAM. INDICATED

SIGNED Richard Roe M.D.

Fig. 1.

HEALTH AND SAFETY
PHYSICAL DEMANDS ANALYSIS ABSTRACT

Plant: PWA Dept.: 32 Job Code: 700.2
Job Title: Crib Attendant — A — Shop Crib Occ. Code: 780
Surveyed: Date: 7-23-48 Approved: Date:
Accepted: Date: Edited: Date:

Description of Duties: Carries (1) 1 to 15 lb. part such as drill, cutter, file, grinding wheel, etc., 3 to 25 ft. from bins to crib window or from crib window to bins constantly to issue, receive and store parts. Carries (1) 35 to 40 lb. tool such as arbor, adapter, fixtures, etc., 5 to 25 ft. from crib window to bins or from bins to crib window occasionally. Writes records and reports. Walks from crib to department in own area to obtain information occasionally. Sits or stands to etch numbers on parts with electric needle occasionally. Operates electric hoist to degrease parts occasionally.

1. BODILY ACTIVITIES	CODES TIME
Walking	50C
Standing	45C
Sitting	5A
Lying	
	Time Deg.
Bending	3C 2
Stretching	1A 1
Twisting	1A 1
Stooping	1A 3
Climbing	1A 3
Crawling	
Pushing	1A 3
Pulling	1A 3
Carrying	1A 3

2. USE OF BODY PARTS		RIGHT Time	RIGHT Deg.	LEFT Time	LEFT Deg.
Arm:	Bending	3C	3	3C	3
	Twisting	2A	3	2A	2
Hand:	Bending	3C	3	3C	3
	Twisting	1A	2	1A	2
Fingers:	Bending	3C	3	3C	3
	Twisting	1A	2	1A	2
Leg:	Bending	2A	3	2A	3
	Twisting	1A	1	1A	1
Foot:	Bending	2A	2	2A	2
	Twisting	1A	1	1A	1
		Time		Degree	
Neck:	Twisting	2A		3	

3. HEARING	3
4. TALKING	3

5. VISION	CODES Time	Deg.
Acuity: Near	2A	3
Far	3C	3
Depth Perception		3
Color Perception		
Work Distance		18"

6. ATMOSPHERIC CONTAMINANTS	CODES Time	Deg.
Dusts		
Fumes		
Gases		
Mists, Vapors		
	Trichlorethylene	1A/1

7. SKIN HAZARDS	CODES Time	Deg.
Acids-Alkalis		
Fluxes		
Synthetic Resins		
Paints, Thinners		
Metal Clean Sol.	1A	1
Corrosion Prev.	1A	1
Solvents, Strippers		
Engine Fuels		
Sol. Cutting Oils		
Soap and Water		
Insol. Cutting Oils		
Lubricating Oils		
Buffing Comp'ds		
Miscellaneous		

8. PHYSICAL AGENTS AND CONDITIONS	CODES Time	Deg.
Temperature: High		
Low		
Rapid Changes		
Wet Quarters		
Noise	4D	3
Vibrations		
Radiations		

9. ACCIDENT HAZARDS	CODES Time	Deg.
Vehicles	1A	2
Moving Machinery	1A	2
Hoists and Loads	1A	3
Walking Obstructions	2A	3
Holes, Pits, Etc.		
Slippery Surfaces	4D	2
High Elevations	1A	3
Flying Objects		
Sharp and Rough Objects	1A	3

10. LIFTING	USUAL Unit Wt.	USUAL Lifts per Shift	MAXIMUM Unit Wt.	MAXIMUM Lifts per Shift	MAXIMUM Joint Lifting
Floor to Bench	15	—	40	—	—
Knee to Bench	15	—	40	—	—
Bench to Shoulder	15	—			
Bench to Overhead	15	—			
Bench to Bench	15	—	40	—	—

Personal Protective Equipment

Remarks

Fig. 2.

that they may be indicated by the physical status of the worker, as following lost-time injury or prolonged absenteeism from any cause. Special follow-up of these cases is made by direction of the plant physician.

Job Placement Investigation

THE HEALTH and safety experiences under this placement plan have been highly satisfactory, as can be illustrated by the records for the period of January 20, 1946 (when the new program was effectively launched), through December 31, 1948. As was pointed out earlier in this discussion, the preplacement rejections due to physical incapacity for any type of employment have been fewer than 1%. Approximately 60% of the more than 20,000 finally placed during the period have been satisfactory for almost any type of job the plant has to offer, and about 25% were capable of doing the work called for by the jobs for which they were employed but not for certain other types of jobs. Not more than 15% of those finally placed were in the group requiring modifications of the jobs, or closely supervised trial placement.

Reclassification examinations of 9,320 persons have shown that about 73.9% still were placed satisfactorily in accordance with the original provisions, while for 2,432 or 26.1%, some additional modifications were indicated and only 0.9% were no longer able to do any type of work in the plant. Although job circumstances may have had some adverse influence upon this experience, the effect was the smallest at any time during the history of the organization. The principal reasons for the decline in physical capacity were non-industrial disorders.

Table I shows the job investigation findings for a sample group of 3,896 placement problems. Fourteen hundred and sixty-four or 37.6% of these workers still were placed satisfactorily regardless of the circumstances which prompted the investigations. While 2,432 or 62.4% of the workers required some further job adjustments, it will be noted by studying Table II that a majority (2,002 or 82.3%) were readjusted by making temporary or permanent changes within their original departments. Such changes cause less confusion to employees and disturbance of work schedules than is brought about by transfers to new and strange jobs in other departments. Only 81 or 3.3% were found to be no longer physically capable of employment on any job the company had to offer them. Forty-seven or 1.9% have not yet been finally classified because of prolonged absences from the plant and other reasons. Forty-two or 1.7% terminated for "other" reasons.

TABLE I.
TYPES OF JOB CHANGES REQUIRED AND THE NUMBER OF INDIVIDUALS INVOLVED
Pratt and Whitney Aircraft
January 20, 1946 — December 31, 1948

Job Changes	Persons Involved Number	%
Total Cases Investigated	3896	100.0
Cases Requiring Job Change	2432	62.4
Cases Not Requiring Job Change	1464	37.6
Type of Job Changes Required		
Total Cases	2432	100.0
Temporary—original job and dept.	513	21.1
Permanent—original job and dept.	446	18.3
Temporary—another job—original dept.	933	38.4
Permanent—another job—original dept.	110	4.5
Temporary—transfer to another dept.	102	4.2
Permanent—transfer to another dept.	158	6.5
Terminated—no suitable job	81	3.3
Terminated—other reasons	42	1.7
Temporarily absent	47	1.9

TABLE II.
ABNORMAL ELECTROCARDIOGRAMS, BY AGE GROUPS, AMONG PERSONS NOT PREVIOUSLY KNOWN OR SUSPECTED OF HAVING CARDIAC DISORDERS
Pratt and Whitney Aircraft
December 1945 — December 1948

Age Groups	Total Persons	Abnormal Electrocardiograms Number	%
Total	231	63	27.3
20 — 29	90	13	14.4
30 — 39	85	23	27.1
40 — 49	37	15	40.5
50 — 59	16	11	68.8
60 and over	3	1	33.3

Cardiac and Vascular Cases

AS WAS MENTIONED earlier in this discussion, cardiac and vascular cases can be used for the purpose of illustrating our methods of handling the various types of physically limited persons. Specific diagnostic techniques vary from the standard evaluation and placement pattern, but the same can be said for other specific types of disorders or exposures. The procedures regarding the placement and follow-up of all cases are basically the same. The cardiac and vascular cases contribute to the over-all job placement experiences which were just mentioned. Our experience with them can be illustrated more specifically by reviewing a sample group. This sample includes 445 known or strongly suspected cardiac and vacular cases. The actual number of cases in the plant as of a given time is difficult to determine, but it is believed to be in keeping with the number to be found in other large plants. Our preplacement figures over the past several years have revealed that approximately 3% of the applicants had cardiac disorders. We also have found that about 2% presented evidence of vascular troubles. Our total figure of approximately 5% with cardiac and/or vascular disorders is about the same as that found on examination of registrants for military service during World War II.

In addition to the 445 cases in the sample under consideration here, we have another group of 231 persons that received electrocardiograms and other specific examinations. These persons were not previously known or suspected of being definite cases but were examined because of age, skill demands, and other special reasons. They are shown in Table II. Sixty-three or 27.3% were found to have abnormal electrocardiograms; thus, the importance of this diagnostic procedure for such special groups of employees is further demonstrated. Four of these individuals were transferred to safer jobs, and the others with positive findings are being kept under close observation. Thus far, their experiences on their original jobs have been satisfactory.

TABLE III.
KNOWN OR SUSPECTED CARDIAC CASES WITH ABNORMAL ELECTROCARDIOGRAMS ACCORDING TO AGE GROUPS AND JOB-PLACEMENT STATUS
Pratt and Whitney Aircraft
December 1945 — December 1948

Age Groups	Total Cases	Abnormal E.C.G. Findings Number	%	Job Status (Total Cases) Satisfactory Number	%	Job Changed Number	%
Total	445	241	54.2	360	80.9	85	19.1
20 — 29	46	22	47.8	42	91.3	4	8.7
30 — 39	106	40	37.7	102	96.2	4	3.8
40 — 49	127	59	46.5	110	86.6	17	13.4
50 — 59	109	73	67.0	75	68.8	34	31.2
60 +	57	47	82.5	31	54.4	26	45.6

Table III shows the 445 known or suspected cardiac and vascular cases in relation to the number with abnormal electrocardiograms, and whether their jobs were still satisfactory. The suspects in the group have not as yet presented any conclusive diagnostic findings, but in view of past histories of episodes and the presence of subjective symptoms, they are being kept under close supervision until a positive diagnosis can be made. They make up about 20% of the group, and job performance and clinical experience suggest that approximately 10% of them eventually will be diagnosed as negative.

Three hundred and sixty or 80.9% were found to be still satisfactorily placed on their original jobs, while 85 or 19.1% required further job investigations. The job-placement experience of the salary-rated personnel was definitely better than that of the hourly-rated. There were 195 salary-rated persons in the group, and only 9 or 4.6% required further changes of their jobs subsequent to original placement. Of the 250 hourly-rated cases, 76 or 30.4% required further job changes. Of these 76 individuals, 54 were readjusted within their original departments. In most instances, this readjustment consisted of assigning the worker to a portion of the duties involved in his job code. Two of the persons died, and one terminated for reasons not related to working ability.

No effort was made in the analysis of this sample to compare the relative rank of cardiac and vascular diseases among the other disorders which were responsible for job changes. It is our impression, based upon a separate

tabulation not shown here, that the rank is about eighth or ninth in the list.

The job readjustment experience of this sample group of cardiac cases also was somewhat better than that of the 9,320 who were re-evaluated during the period. Of the 445 cardiac and vascular cases, 85 or 19.1% required job changes while 2,432 or 26.1% of the total number of persons re-evaluated needed some job readjustment.

There is indication that the cardiac and vascular cases required transfers to new jobs somewhat more frequently than others with placement problems.

Summary

THE FUNCTIONAL capacity evaluation and job placement procedures for handling various types of physical defects in the Pratt and Whitney Aircraft were outlined briefly, and the experience with cardiac and vascular cases was pared with that of other types of disability cases.

Preliminary comparisons of a sample group show that, when properly evaluated, placed within the limits of their capacities, and followed up routinely, the experiences of the cardiac and vascular cases have been at least as good as, and in some respects somewhat better than those of a larger group of employees having a variety of physical disorders.

[ACKNOWLEDGMENT: The diagnostic and case handling service to the cases covered in this paper were rendered by Dr. Roland C. Carignan, Medical Supervisor, and Dr. C. W. MacMinigal, Health and Safety Administrator. Their contributions as well as those of other members of the Health and Safety staff who participated in the job placement work and the studies covered here are gratefully acknowledged.]

The A. C. S. Minimum Standard

THE American College of Surgeons grades medical services according to one of four ratings, based upon the degree of compliance with the provisions of the Minimum Standard:

1. *Fully approved with the granting of a certificate.* This type of service has met all of the requirements of the Minimum Standard and is carrying them out in an acceptable manner.

2. *Fully approved.* A certificate is held in abeyance due to some more or less minor deficiency condition or conditions readily amendable.

3. *Provisionally approved.* This service has more deficiencies than the above, and consequently less compliance with requirements to merit full approval.

4. *Not approved.* This service has not met the requirements to any appreciable degree. Not infrequently, resurveys of previously substandard rated services reveal that they have become eligible for the full or certified approval rating.

Since the report of October 1, 1949, 134 surveys of industrial medical services have been made. Of this number, 81 were new surveys, 68 of which were adjudged eligible for full approval. Of this number, 62 qualified for certificates of approval. Of the remaining new surveys, three were granted provisional approval and 10 were not approved.

Of the 53 resurveys, conditions showing marked improvement were found in 38 services previously rated below the certified level, 34 of which became eligible for certificates. No change was made in the ratings of 15 of the resurveys.

Subsequent to the publication of the 1949 Approval Number of the *Bulletin*, 38 companies out of 52 were eligible for approval of their medical services. The 1950 Approval Number of the *Bulletin* will contain these new additions. All approved medical services are published annually.

Psychological Considerations in the Rehabilitation of the Cardiac Patient in Industry

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IN OUR ordinary thinking, the rehabilitation of the diseased person is usually thought of as a restoration of the capacity for work. An early nineteenth century use of the word "rehabilitation," however, suggests to us another and, perhaps, equally important meaning. This is an interpretation of rehabilitation as the re-establishment of character or reputation, or, as we might paraphrase it today, the restoration of security and self-esteem. This latter goal is a particular task of the rehabilitory management of cardiac disease.

The personality reactions to disease and dysfunctions of the heart are complicated by the very nature of cardiac disorders. The patency of a chronic cardiac disease often is established by a sudden acute illness which, in itself, may be only the first of a series of intensely distressing and incapacitating episodes in the chronic process. The cardiac patient is thus presented with the necessity of reacting to both sudden and delayed threats to his life and to his psychologic well-being, ease, and security.

Since almost all the cardiac disorders of concern to industrial physicians occur in adult individuals, the reaction-biography of each individual must be assessed at least casually before we know how each person is likely to react and to be reacting to his disease.

The description of these personality reactions is a task which psychiatry and psychology have yet to accomplish adequately. Nevertheless, if we consider the major emotional manifestations of various behavioral responses, we can define at least two general groupings of such emotional expressions. When the need or drive tensions evoked by various physiological and psychological desires or hungers are well-gratified, one can describe the resultant feelings of pleasure, well-being, and calmness as the ease-producing reactions. Contrastedly, the dys-ease producing emotions, such as anxiety, resentment, hostility, and depression arise because need-tensions have been induced which cannot be readily and adequately discharged.

Two fundamental considerations are involved in the discussion of this dys-ease inducing behavior. One basic assumption must be that the characteristics of anxiety, resentment and depression are, in adults, largely derived from the early childhood interpersonal experiences of the person. It is only by this postulation that we can explain the "irrational" nature of such emotions in adulthood and their disproportionate intensity frequently evoked by very trivial cues from present situations. The anxiety-ready adult, for example, usually can be shown to have developed, as a child, considerable fear about the expectation of punishment and injury or of being left alone or abandoned by the people necessary to his security. In other words, he learns very early, partly by real experience and partly by fantasy based on that actual experience, that if he is not "good," or better, "good enough," he will be left insecure. Because of his anxiety, he then begins to pay too high a price for security and becomes afraid to learn any new habits which might enable him to become self-secure and independent. He keeps on trying to get what he never really had, and he carries forward into adult life the same anxious expectancies, now largely beyond his conscious awareness, of punitive retaliation by the world or of the sudden withdrawal of security. In a very real sense, this anxiety-laden adult, whom we call neurotic, is running from people who stopped chasing him a long time ago, or he is buying at an exorbitant price dependency and love from people who can no longer either withhold or give it.

Similarly, the resentment and hostility reactions have their genesis in the early interpersonal experiences where the fusion of anxiety and hostility, which we designate as resentment, is developed. Although the insistence of maturity is that one should become independent and affirmatively self-sufficient, no one gives up his dependency gratifications without considerable hostility towards the depriving source. Indeed, some of us do not readily give up our infantile quest for dependency but continue it unconsciously as adults. We therefore resent our contemporaries because it subjectively appears that they deprive us and give us less than our due. We keep ourselves chronically but suppressedly raging against them. We are still fighting people who stopped depriving us a long time ago.

The depressive reactions, whose main characteristic is a loss of self-esteem, likewise have their origin in early childhood and they frequently represent a sequence of reactions to guilt, which was learned as a child. The young child may learn that if he does some prohibited disapproved act, he is punished by being made to feel ashamed and "bad," and after a period of such expiatory suffering and diminished esteem, he is then forgiven and re-established in the good graces of the parents. Many adult depressions have the same consciously unaware meaning. Trivial insults to self-esteem touch off unaware guilt reactions and set the sequence of self-depreciation and unworthiness in action.

The first basic assumption then, in the consideration of these emotional reactions of anxiety, resentment, and depression, one or all of

which are frequent personality accompaniments of cardiovascular disease, is that much of their meaning may be unconscious. Their intensity may be due largely to the fact that the learning experiences this individual has had as a child are being maintained as if the present were still the past. He has yet "to unlearn" this knowledge.

The second important consideration concerning emotional behavior is that emotions are also physiology. The reactions in the person are reactions in the body. This is the fundamental proposition of what we are today calling psychosomatic medicine, a new name for an old practice.

NO OTHER organ system of the body is so intimately concerned with emotion as is the heart. It is the veritable "seat of the passions." Chronic or acute emotions, therefore, find partial expression in cardiac action. If the heart is already an area of morbidity, emotional response may become in various ways a source of significant stress. This is more true for some cardiac diseases such as coronary insufficiency or left ventricular failure with paroxysmal dyspnea than for some other cardiac disorders in which neurophysiologically direct emotional determinants of morbidity may be more questionable.

The psychological implications of the rehabilitation and treatment of specific cardiovascular diseases may now be considered.

Initially, however, it may be desirable to discuss briefly the cardiac neurosis or psychogenic cardiovascular reaction in "pure culture" as it may occur in subjects with intrinsically healthy hearts. The psychological basis for this is a somatization or "cardiazation" of any anxiety reaction, whose general psychodynamic implications we have just discussed as producing incongruously intense anxiety to inconsequential present events because the cues given by these events touch off unconsciously maintained fears of punishment or loss of security. The so-called choice of an organ for these organ-neuroses is determined by many factors. Nevertheless, it happens frequently that subjects in whom anxiety is created by external or intrinsic stress, form a psychological association between their subjective feeling of anxiety and the symptoms of the normal physiologic response of the heart to such emotion. From that time on they may assert the proposition "I am anxious about my heart!" The normal reactions of the heart to fear become themselves the causes of fear. In this sense the individual literally becomes afraid of his own anxiety. Moreover, in addition to this psychologic trick of putting his anxiety into his heart, the individual now can protect himself from anxiety by protecting his heart from any situation or activity which might make the heart "palpitate" or increase its tempo or stroke volume. Earlier, he would now be classified diagnostically as having De Costa's syndrome or neurocirculatory asthenia or effort syndrome or as suffering from a "functional limitation" of the heart's capacity for work. The essential thing to understand is that such a person generalizes his anxiety to any situation in which palpitation symptoms might arise and that it is the anxiety and not the effort which produces the racing pulse and the breathlessness and the intolerance of effort.

Additionally, since illness in our culture is rewarded usually by increased dependency-gratifications and permissive release from responsibility and social and occupational discipline, the epinosic or secondary gain which comes as a result of these illness-rewards plays a significant part in the maintenance of the psychogenic cardiovascular reaction, as indeed it may do in any form of cardiac disease. The unconscious use of the cardiac neurosis or disease to satisfy dependency needs, and to escape the rigors of independent discipline must be dealt with therapeutically by seeking to interpret to the individual what he is really trying to do, and to make him aware of his maladjustive habits, and to help him learn that his expectations about the world, which he has generalized from a specific insecure and anxiety-inducing family context, may be revised more closely in conformity with reality.

The psychogenic cardiovascular reaction frequently seen as a somatization reaction to anxiety also may be associated frequently with actual heart disease. Characteristically, this may have occurred in adults who have well-compensated rheumatic heart disease. The attention to the psychologic management of the young patient with acute rheumatic heart disease is, in these instances, really an aspect of preventive medicine.

The necessary restrictions as to activity imposed upon the young rheumatic patient may, if psychologically mishandled, lead to a fusion of activity and anxiety which becomes a permanent association, and continues after activity limits are removed or diminished. The young cardiac patient, therefore, should be encouraged to share his anxiety about what he thinks has happened to him and he should be allowed as frankly and as forthrightly as possible, to participate in his convalescent treatment by knowing how his healing goes on and what the activity restrictions have to do with the facilitation of healing. Moreover, with an eye on the learning that may develop about how an illness may be rewarding in terms of attention, solicitation, and release from distasteful life-tasks, when the child cannot go to the world to participate in its demands, the world, so far as possible, should be brought to him in the form of a visiting teacher and daily educational and social tasks which can be performed in bed or in a chair. The neurotic adult's maneuvers to use the chronic heart disease to excuse himself from the ordinary demands of living thereby will be considerably diminished.

The importance of the heart as a neurotic defense in the psychologic economy of the in-

dividual is well illustrated by a patient who had a relatively symptom-free patent ductus arteriosus. With her defective cardiac anomaly as the rationalization, she was leading an anxiety-constricted life in which with characteristic neurotic urgency she was "trying to save her life by saving it." After successful ligation, the cardiac rationalization for restricted physical and psychological activity could no longer be maintained. She then developed obsessive concern and fear of suffocating if she went outside alone, thus replacing by an external phobia the internal phobia which for a long time, and, as she believed justifiably, she had lodged in her heart. As Voltaire said of God, "If she did not have a reason for anxiety, she would have to invent one."

It would seem that the significant thing to keep in mind in dealing with the over-anxious patient with the compensated chronic rheumatic heart disease is that he has a neurosis of long-standing. Nevertheless the simple technique of accepting the sharing of his feelings and of granting him the right to have such feelings and the use of calm, non-admonitory reassurance in the setting of a good physician-patient relationship have real therapeutic value. Some of the more obviously anxious patients may be referred for more extended psychotherapy at the hands of the psychiatrist.

One additional suggestion occurs in relation to all chronic rheumatic heart sufferers with reference to employment. This refers to what I would call pre-morbid rehabilitation. This implies the assessment of the probable patently morbid phase and the preparation of the employee for this both psychologically and occupationally before any necessity for work or activity restrictions is apparent. In many cases this may imply the additional learning of a new and physically less demanding skill to which the employee will then be already prepared to shift as soon as medical restrictions become necessary.

WITH the actual onset of cardiac failure, additional psychological problems develop. Significant here is not only anxiety but also depression. Important also in many persons who have been compensatory psychological over-strivers in life as a denial of their dependency needs, an intense denying that they are threatened or handicapped in any way results in their ignoring the necessary cautions as to restrictions and leads to the rejection of the fact that they are ill. Since most of us hate to admit threats to our self-sufficiency because of the immature feeling that such an admission is somewhat "bad," we succeed only in being depressed and defiant. These same persons, incidentally, are a problem, too, of preventive medicine because they do not seek a physician until a physician has to seek them. Even going to see a physician for the premonitory signs of failure or a coronary insufficiency is more of an admission of illness than they are willing to make.

Nevertheless, these people are, in many instances, more profitable psychotherapeutic candidates than the frankly anxious reactors. Here again, allowing, and actively helping them to share their resentment, their shame and chagrin about the dent in their armor of self-sufficiency and to help them to discriminate between real and irrational threats to their self-esteem is quite possible and feasible. When the helping aspect of the doctor-patient relationship is combined with the medical management of the patient's heart disease and all of this is placed in an industrial setting where the patient's security and self-esteem are supported by a productive even though different and less demanding job, then it would seem that we are practicing comprehensive industrial medicine.

These same general considerations apply to the rehabilitation of the employee suffering from coronary cardiac ischemia and to the patient with coronary cardiac infarction. Depression and anxiety are frequent sequelae to a coronary occlusion, and should be treated as a part of the illness. Also it is important to observe that there is a simple task involved in communicating to the patient the difference between the contemporary folk-lore of coronary occlusion and the present scientific knowledge of the relatively more optimistic progress of this disease.

If we turn for a moment to the neurophysiology of emotion in relation to coronary artery disease we may consider briefly the possible effects of anxiety and resentment in precipitating anginal attacks. We are always fond of quoting Sir John Hunter in this respect, whose well-known assertion was that, "My life is at the mercy of any scoundrel who chooses to put me in a passion." The scoundrel who fulfilled the promise was one of the board of governors of St. George's Hospital. This incident may illustrate that there is a real possibility of myocardial infarction resulting from an acute decrease in blood flow attendant upon emotionally-induced coronary vasoconstriction without occlusion. Obviously this can occur only in the presence of an already existing angina and hence an already damaged coronary system. Nevertheless since the medical task in angina pectoris is to keep the attacks as short and as infrequent as possible, some attention should be paid to seeing that the patient understands the possible danger of the "scoundrel who puts you in a passion" and to attempt a sharing and ventilation of any persistent and too-ready anger or hostility reactions. If possible, we do not want him, because of frequent habitual intense emotion, to encroach upon the coronary reserve either by the constriction of the coronary arteries or by an acceleration of the work of the heart.

With much less practical importance, perhaps, similar consideration of the emotional determi-

nants of paroxysmal dyspnea might be adduced. Here the primary focus is on the emotionally-induced effects on respiratory minute volume and pulmonary ventilation. In patients with pulmonary congestion and reduced vital capacity, dyspnea may be induced because of an emotionally engendered increase in respiratory activity. Some of the paroxysmal attacks at night may very well be the result of emotional excitants developed in dreams. Since a good deal of the psychological management of the cardiac patient really involves health education and insight into psychophysiologic processes, the practice of group psychotherapy in the communication of this knowledge might be advantageous in the industrial setting. In groups of eight to 10, in hourly or half-hourly sessions over a few weeks, cardiac patients would develop a sharing of feeling with fellow-sufferers, ventilate more freely their anxieties and resentments and, without the ordinary inhibitions and resistances they might have otherwise, come to learn and really to accept most of the implications of their disease. Group treatment, in this sense, would seem to be an important technique for the industrial physician.

In closing, I can think of no better summation of the psychosomatic aspects of cardiac disease than that made by Binger at a recent lecture at the New York Academy of Medicine. In his last paragraph he wrote: "Perhaps the poets could write for us a real treatise on the irregularities of the heart—that extraordinary acrobatic and versatile organ which leaps and bounds and jumps and turns over and sinks and rises and catches fire and freezes and is light as a feather or as heavy as lead. Finally it stops, and that is what we are all afraid of."

Reference

BINGER, C.: Psychological Phenomena in Cardiac Patients. *Bull. N. Y. Acad. Med.*, 24:687, 1945.

New Treatment for Shock

SALT WATER taken by mouth is as effective as blood plasma in the emergency treatment of shock from serious burns and other injuries, in a vast majority of cases, advises the Surgery Study Section, an advisory body to the National Institutes of Health and to the Surgeon General of the Public Health Service. In general terms, the treatment calls for approximately one level teaspoonful of table salt and one-half teaspoonful of baking soda for each quart of water. A number of quarts are required each day. The only limitations on the amount consumed is the ability of the patient to consume the saline solution. Since great thirst accompanies serious burn injury, it has been found that patients will voluntarily consume a sufficient amount of the solution, which is quite palatable. No other drinking fluid is permitted in the first few days following injury.

—From Federal Security Agency, Release.

Management of the Employee with Hypertensive Cardiovascular Disease

JOHN C. LEONARD, M.D.,
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THE TOPIC "Hypertensive Cardiovascular Disease" will be taken up, not from the standpoint of an expert, but from that of an average physician. We have been told, and know it to be true, that coronary artery disease and coronary insufficiency are common findings in industry. Certainly one might consider them even more seriously significant when hypertension and hypertensive cardiovascular disease also are discussed. The patient with hypertension and hypertensive cardiovascular disease faces the same potential dangers as does the patient with sclerotic coronary arteries, and for this reason I feel that the conditions in industry are closely allied.

Mechanisms

IT SEEMS entirely possible that hypertension may result from a varied succession of events, in which I think the psychological aspect might be placed first. The neurologic side of the problem is undoubtedly important as is the more recently considered metabolic consideration. The humoral mechanisms involved have been debated for many years and their importance considered. The physical side purposely has been placed last in its contributing effect, for it is felt sincerely that this is where it belongs.

If the psychologic, the neurologic, the metabolic, and the humoral aspects are considered as factors in the etiology of hypertension, the work of Hans Selye in Montreal can be reviewed with much interest. If his experimental work is basically sound in emphasizing the importance of the stress side of hypertension there well may develop a more complete understanding of the important factors contributing to hypertension even though the actual etiology of hypertension remains as yet unknown. These stress factors, at first intermittently, and later continuously, tend to raise the arterial blood pressure. Eventually, perhaps as an adaptation process—again reminding one of Selye's work—the central integrating mechanism controlling basal arterial pressure may become set at a higher level, establishing, as it were, a vicious circle of influence.

Furthermore, it is possible that the number of inciting and/or precipitating and perpetuating factors may increase or decrease as time goes on. One factor only in some patients, while in others a combination of factors, may be acting to sustain the elevation of arterial blood pressure. Therefore, in order to lower the pressure in some patients, it may be necessary to correct only one of these factors. These are perhaps the least complicated for the physician to handle. In others, it may require a number of different therapeutic procedures applied successively or simultaneously. This may explain why each new medical or surgical "cure" for hypertension eventually fails after seemingly having been successful for a brief period.

The physician carefully must evaluate each patient with hypertension in order that he not overlook one important factor that can produce a cure in hypertension. Coarctation of the aorta always must be considered. New surgical techniques for the correction of this congenital defect may and do help those persons in this relatively small group. The surgical cure for hypertension that can follow the removal of a medullary tumor of the adrenal, a pheochromocytoma, is dramatic. It is therefore important to determine the cases of hypertension that fall into this group. Formerly it was thought that only those patients with paroxysmal hypertension need be suspected of having a pheochromocytoma. It is now recognized that a certain number of persons with sustained hypertension actually may be found in this group.

Ten years ago, unilateral renal disease was considered to be an important cause of hypertension in perhaps as many as 20% of cases. Those figures now have dwindled to about 5% or less, but even this 5% should not be overlooked. Fortunately, it is not difficult usually to recognize the patients whose hypertension is on the basis of a brain tumor. And this, if it is the "gentlemanly" type of brain tumor, can be removed surgically with every prospect of a cure for the hypertension.

Care must be exercised to find those who have, as the etiologic factor in their hypertension, chronic, acute or sub-acute glomerulonephritis, and long-standing pyelonephritis, and about which perhaps too little can be done. Patients with congenital polycystic kidneys may live into, and through, the teen age period. Many actually may reach middle or old age, before an examination will show the eventual presence of hypertension secondary to this congenital type of kidney involvement.

It is necessary that the investigation of a patient with hypertension be as complete as possible. The medical history, of course, is extremely important, and should be the first consideration, and should be followed by a family and social history. More recently, the value of a good industrial history has been emphasized

strongly. Now being pointed out and with good cause, is the great importance of the emotional and socio-economic history, as these factors play a great part in many cases of hypertension.

The physical examination, obviously, is important, for otherwise the hypertension would not be found. The examination should always include a careful study of the eye-grounds and the blood pressure under varying circumstances. Master, Ayman, Hines and others demonstrated some years ago that almost any level of pressure may be found in the early excited stage of the first medical examination, whether carried out in the physician's office, or in the hospital, or in an industrial dispensary. An x-ray of the chest for heart size and shape is extremely important as is an electrocardiogram, if for no other value than to have a negative record as a base line for future reference. Studies of the urine may indicate the cause of the hypertension and should include not only the routine urinalysis for albumin and a study of the sediment but also a phenolsulfonephthalien test when necessary. Perhaps as an increasingly important part of our base line knowledge of hypertensive patients, intravenous pyelography should be done. Although this procedure is still under discussion, it has been found to be helpful in providing information regarding the etiology of the hypertension.

The mean supplemental pressure in a group of normal subjects has been found to vary by approximately 20 mm. of mercury. In a group of hypertensive subjects, the mean supplemental pressure was 45 mm. of mercury, showing the great difference in the response in blood pressure of this group of patients. There is also a group of patients, the so-called hyper-reactors, who fall between the normal patients and those with already established hypertension. There is considerable evidence for the belief that a greater percentage of this latter group will be future hypertensive patients.

The variation in blood pressure between these figures of 20 and 45 mm. is statistically significant in a great number of patients. In a group of hypertensive subjects with congestive heart failure, however, the mean supplemental pressure was approximately 10 mm. of mercury, significantly lower than that of the normal subjects, and lower even than hypertensive subjects without heart involvement.

Prognosis

WHAT CAN BE said quickly as to prognosis? Approximately 75% of these hypertensive patients, if they survive accidents and trauma, will die of coronary thrombosis and myocardial infarction. Another 15% probably will die of cerebrovascular accidents. Finally, despite the great blame that has been placed by so many investigators upon the kidneys as the source of all hypertension, only 5 to 10% eventually will die of renal failure.

Case Reports

THE FOLLOWING are two illustrative case reports. In 1936, the blood pressure of a 37-year-old graduate nurse was found to be 160/90, sustained on several visits. This is a little higher than normal. In her case this seemed significant since her father, mother, two brothers, and one sister had all died under 45 years of age of hypertension and its complications. This knowledge caused her to be apprehensive. In six months, at the time of an operation for bursitis of the shoulder, her sustained blood pressure was 190/100. After one year of conservative treatment she was offered surgical therapy which she refused. However, a depressive mental state developed, and she was hospitalized in a psychiatric institution for nearly a year. During her stay her blood pressure rose to 240/130. In 1938 her depressive state receded and upon discharge from the institution she was given a new type of work. Instead of continuing as a night supervisor, she was given a school nursing job on an eight-hour per day basis. Slowly her blood pressure dropped to 190/100. Also, during this time, she was allowed frequent discussions of her emotional problems. In addition to mild medication with phenobarbital, the most valuable treatment proved to be the discussions of one-half to one hour once weekly, then once a month, and finally every three to six months as her condition improved. Since 1939, this patient's blood pressure has dropped from 180/100 to 135/90 with no treatment other than mild psychotherapy, such as the ordinary family physician can give.

The second case is that of a 48 year old dock worker, who was seen first in 1945 with a combination of syphilis, hypertension, and anxiety state. His blood pressure was 220/120. Ten years before he had been treated for a gumma, his serological findings were reversed, and he was thought to be well. His chief complaint when seen in 1945 was angina pectoris, and a recurrent positive blood test for syphilis was present. The spinal fluid was negative, and the heart size was normal. He was given two and one-half million units of penicillin, intramuscularly, his blood test findings were reversed, but his hypertension and angina pectoris persisted. It finally was determined that other factors were causing the patient to worry. The patient was concerned about his wife who was about to have a baby. He feared, because of his recent positive blood test, that his wife and baby would be affected. A test showed his wife's blood to be negative, and his three children also had negative blood tests. His hypertension persisted however, and he required 10 to 30 tablets of nitroglycerine a day for what appeared to be angina pectoris. One week after his wife delivered, and after it was determined that the baby had a negative blood test for syphilis, his blood pressure dropped from 220/120 to 140/90.

Within a month, it was down to 130/80, and his pressure has remained within normal limits to the present time.

Conclusion

IN CONCLUSION it is stated that our clinic just about has ceased sending patients for surgical treatment for hypertension, except as a last resort, for it does not seem reasonable that one successfully can operate upon the emotional factors that are present.

Discussion

QUESTION: What would you consider a dangerous level of blood pressure, beyond which an employee should not operate a bus, a streetcar or a rapid transit train?

DR. LEONARD: I have been using an arbitrary figure of 180 systolic over 100 diastolic. That again, just as in the case of coronary insufficiency and coronary thrombosis, has to be individualized. In general, I think this statement of levels can be made in the knowledge of the fact that three out of four patients with essential hypertension ultimately do have coronary thrombosis or myocardial infarctions. That is, there is always a great degree of risk.

There is another important point. If this hypertensive person has been wise enough to choose carefully his ancestors, and they come out of people who live to 75 or 90 years, then he has much less chance of ending that way early, and therefore causing danger to other groups of people who may be temporarily under his care on a train. I think one has to individualize that again.

I wish we could offer a positive answer. We have tried at times to set the level of 200 over 100, but this is undesirable for if a patient has any of these complications, and one allows him to go through, one has been guilty indirectly of a crime. So again, I think we can say only that this has to be individualized, and there is a definite risk.

Who Pays?

THE MANIA for compulsory pensions at 65 has been promoted chiefly by labor union bosses and the New Deal politicians. The labor bosses want pension plans which will force their members to stay obedient; the politicians promise pensions as a method of buying the votes of the ignorant and improvident. Pensions cannot be provided by waving a wand or making a bookkeeping entry. They must be paid by the people who are producing goods and services. The more workers who are forced into idleness, the less goods will be available. When goods are scarce, prices rise and the purchasing power of pensions declines.

—From *Chicago Daily Tribune*, October 5, 1950.

Toxicological and Metabolic Effects of Fluorine-containing Compounds

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THE toxicity of fluorine-containing compounds has always been a subject of widespread interest and has been known since fluorine was first recognized as an element by Sir Humphrey Davy and Andre Ampere in 1813. The name fluorine, from the Latin "fluere" meaning to flow, is generally attributed to George Agricola in 1524. It was first isolated in pure form by Henri Moisson in 1886 by the electrolysis of HF and KHF_2. The toxicity problem, owing to the impetus of the war, has recently aroused new interest because of the tremendous development of the chemistry of fluorine-containing compounds. It is the purpose of this review briefly to discuss the facts previously known as well as the more recent developments in this field. It is not the purpose to summarize in detail all of the work done, but rather to discuss the various broad aspects of the field, and mainly from the point of view of mechanisms involved. There are previous excellent reviews in this field.[1,2,3]

In the past, the toxicity hazard of fluorine compounds has been encountered in the smelting of cryolite and in the use of fluorides as insect sprays, roach powders, and rodenticides. But since the war, the industrial development of fluorine compounds has undergone tremendous expansion. The demands of the Manhattan Project for greases and lubricants, chemically inert, and resistant to high temperatures and pressures have been, in the main, responsible for this development. Completely fluorinated hydrocarbons were synthesized and were found to fit these needs. As a result of investigations carried out, fluorine compounds have now found wide industrial use in products such as dyes, plastics, pharmaceuticals, tanning agents, metal fluxes, fumigants, insecticides, fungicides, germicides, fire extinguishers, solvents, fireproofing compounds and heat transfer media.[4]

Fluorine is abundant in the non-living as well as the living worlds. It is present in waters in varying amounts, while in the earth's crust it is the 20th element in abundance, occurring as the minerals fluospar (CaF_2), cryolite (Na_3AlF_6), and sedimentary phosphate rock ($Ca_3(PO_4)_2CaF_2$). In an analysis of 63 vegetables the fluorine content was found to vary from 0.0006-0.138%, with an average of 0.026%.[5] More recent studies tend to confirm this earlier work.[6] Plants grown on soils rich in fluorides have increased fluorine contents, but these increases are not necessarily proportional to the amounts of fluorides in the soil. However, foods cooked in water containing fluorides absorb this element from the water.[7] Analysis of animal tissue reveals its presence in varying amounts, with highest concentrations in bones and teeth.[8]

Since this element is so widespread in plant as well as in animal tissues, it might well be asked whether it is of any physiological significance in trace amounts. This question has not been completely answered as yet. Earlier evidence seemed to indicate that it is non-essential, and animals can live, grow, and reproduce normally on diets containing extremely low amounts of fluorine.[9] However, more recent work tends to refute these earlier conclusions.[10] Further investigation of this point is necessary.

On ordinary ingestion, fluorine is totally excreted, mostly in the urine, and in smaller amounts in the feces, milk, and sweat. None is stored. With larger amounts, about 50% is excreted and the remainder stored, mostly in the bones and teeth.[11]

Acute Toxicity

PHARMACOLOGICALLY fluorides are classified as general protoplasmic poisons.[12] Hydrofluoric and hydrofluosilicic acids and their more soluble salts, when locally applied, cause somewhat painless necrosis and ulceration, with subsequent sloughing and slowly healing yellowish ulcers. Ocular effects include ulceration of the conjunctivae, light sensitivity, and continuous conjunctival secretion. These local effects are best treated by copious lavage and application of ointments containing metallic oxides, such as magnesium oxide, which combine with fluorides.[13] Local injections of calcium gluconate are also very helpful in preventing spread and absorption. Inhalation of gaseous hydrofluoric acid or fluorine causes marked bronchial irritation, with much mucous secretion, bronchial constriction, and pulmonary edema. A mysterious fog disaster was reported near Liege, Belgium, in December, 1930 (reminiscent of the recent Donora, Pennsylvania, disaster) in which 60 were killed, with circumstantial evidence of toxicity resulting from gaseous fluorine compounds (HF, SiF_4).[14]

Acute poisoning in humans results in signs and symptoms referable primarily to the gastrointestinal tract, and central nervous system. They include anorexia, nausea, vomiting, salivation, heartburn, abdominal pain, diarrhea, epileptiform convulsions, respiratory and cardiac failure, fall in blood pressure, and death.[15] The toxic dose is approximately 0.25-5 grams of NaF. An epidemic has been reported in which fluorides

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were used in the preparation of powdered eggs for food.[16]

Animal studies parallel the case reports. Symptoms observed in dogs, rabbits, guinea pigs, and cats are vomiting, salivation, lachrymation, cramps, drowsiness, weakness due to vasomotor paralysis, general paralysis, acceleration and deepening of respiration.[17] On postmortem examination hemorrhagic gastro-enteritis and degeneration of the liver and kidneys have been found.[1]

Chronic Toxicity

SMALLER amounts of fluorides taken into the body over a longer period of time lead to a syndrome which has become quite well defined and termed fluorosis. The effects are probably best known in the case of teeth, which become discolored, ranging from a grayish white to a dark brown. Concurrent with the pigmentation, there is destruction of enamel and dentine, starting with chalky white deposits in the early stages progressing on through pitting and erosion to almost complete destruction. Dental fluorosis has been described as an endogenous condition in regions where the drinking water has an abnormally high fluoride content, usually above five parts per million. This subject has been recently reviewed and discussed.[18]

This affinity of fluoride for hard structures is further exemplified by its effects on bones. As previously stated, it tends to accumulate in bones leading to hypercalcification and brittleness. Ligaments and tendons also become calcified. Serious symptoms may ensue such as loss of mobility of joints, easy fracture, pressure on spinal cord, etc. In children, it may interfere with normal bone formation.[19] The similarity of this syndrome with the disease spondylitis deformans has been pointed out.[19] Serum calcium has been reported to be elevated and kidney function depressed.[1] In a recent series of papers on the effects of NaF in cattle it has been shown that smaller doses cause an improvement of the calcium-phosphorus balance, whereas larger doses cause a negative calcium-phosphorus balance, with an increased nitrogen excretion. Increasing calcium or phosphorus intake or the administration of aluminum sulfate reduced the severity of the fluorosis.[20,21]

Other effects include alopecia in young men,[22] accompanied by increased fluoride concentrations in hair and nails,[23] anemia[24,25] and decreased blood clotting power due to the binding of calcium. A recent report from Italy reports dysmenorrhea, alterations in growth and weight, lowered birth rate, high incidence of fractures, thyroid alterations, and liver damage in a region of endemic fluorosis.[26]

In experimental animals, chronic intoxication causes diminution of appetite and growth[27]; suppression of estrus and lactation are probably secondary to the inanition.[28] There seems to be no clear effect on basal metabolic rate,[29] and the effects on the thyroid and parathyroid are controversial. An increase has been found in the ascorbic acid content of adrenals and anterior pituitary.[30,31] It has recently been shown that fluoride causes decreased muscle glycogen, increased blood glucose, lactate, plasma phosphorus, creatine, and somewhat smaller increases in organic phosphorus and creatinine. Insulin prevents the rise in glucose but not the other effects.[32,33]

Although not actually a toxic manifestation, the effect of fluorides which has aroused most interest has been the reduction of the incidence of dental caries. This reduction has been noted in areas which are supplied by drinking water which contains a moderate amount of fluoride, approximately one part per million (less than the amount which causes mottling). Since this fact has been consistently confirmed, widespread projects have been begun to fluorinate drinking water artificially in areas where the concentration is low in order to study the reduction of dental caries.[34] Newburgh, New York, is such an example where the content has been raised from 0.1 parts per million to 1.2. Neighboring Kingston, New York, acts as control and has 0.06 parts per million of fluorine in its drinking water. A complete study is being done with periodic examinations, bone x-rays, blood and urine analyses, oral cultures, etc. The cost is $25,000 per year. Local topical applications of 2% NaF have also proved successful.[35,36,37] This method should prove of value in areas where drinking water is obtained from wells, which serve approximately one third of the population. On the other hand, other types of medications such as fluorinated tooth pastes, powders and mouthwashes do not seem to have proved effective.[38] An interesting correlation has been made of the incidence of poliomyelitis and caries to the fluoride content of the drinking water. It has been shown that in areas of high fluoride content the incidence of both caries and poliomyelitis is low.[39] This is important since it had been shown previously that a possible path of entry of the poliomyelitis virus is by way of the dental nerves in sockets of extracted teeth.

In the past, organic compounds containing fluorine have been, with some exceptions, less toxic than inorganic. 3-Fluorotyrosine is such an exception. The following data are by Litzka.[40]

			Lethal dose for Mouse	
	M.W.	%F	mg./kg.	fluorine content
Sodium fluoride	42	45.2	40	18
3-Fluorotyrosine	199	9.5	11	1
o-Fluorobenzoic acid	140	13.6	700	95

Since the war, several new extremely toxic organic fluorides have been introduced and investigated. They include fluoroacetic acid and its derivatives, and esters of fluorophosphoric acid, notably diisopropylfluorophosphate. The former has been used as a rodenticide and called "1080."

It is lethal in dose of 1 mg./kg. for hogs, and 14 mg./kg. for chickens.[41] Kalmbach gives a list of LD50 values for various animals.[42] Foss gives similar data for animals and lists chemical changes that occur during poisoning including rise in hemoglobin, blood sugar and phosphate, terminal rise in NPN and serum potassium. First symptoms to appear in man are nausea and vomiting, mental apprehension followed by epileptiform convulsion. Treatment with control depressants is described.[43] Pathologically, fluoroacetic acid produces hemorrhage and edema of the lungs, petechial hemorrhages in the pericardial and mesenteric fat, enteritis, congestion of the internal organs, and hemorrhages of the ovary and lens of the eye.[44] It is interesting that other halogenated derivatives of acetic acid are not particularly toxic.[45,46] The heart and brain appear to be the organs most sensitive to this compound, the pharmacological effects being convulsions and ventricular fibrillations, the sensitivities varying with different species and with route of administration.[47]

Diisopropyl fluorophosphate is extremely toxic and gives rise to such nervous system symptoms as pupillary narrowing, sweating, lachrymation, salivation and diarrhea. This is well brought out by studies on chronic toxicity of DFP in cats—in which ataxia, extreme muscular weakness, general fasciculation, and other symptoms of cholinesterase depression are manifest.[48] The lethal dose for 50% death in mice (LD50) is 4 mg./kg.[49] Similar signs and symptoms have been shown for dimethyl- and diethyl-fluorophosphates both by inhalation and injections.[49] Wescoe, *et al.*, have shown that atropine and scopolamine abolish the central nervous system effects of DFP.[50] Freedman and Himwich noted no effect of DFP on survival time of rats in acute anoxia after pentobarbital or morphine anesthesia.[51] Another organic compound of recent interest is the fluorine analogue of DDT with the fluorine replacing chlorine on the benzene rings. This compound has been known and used in Germany during the war as an insecticide. Studies reveal that it is less toxic to warm blooded animals than DDT but more toxic in general to insects with an increased speed of action.[52]

Mechanism of Action

THE mechanism of action of the above mentioned organic fluorides has been worked out in part. A large amount of work has been done on these compounds and only a few of the more general aspects will be pointed out here. The great interest in the derivatives of fluorophosphoric acid has stemmed from the fact that they have become potent tools in the investigation of the mechanism of transmission of the nerve impulses. This has been summarized in Annals of N. Y. Academy of Science in 1946[53] and by Grudfest in 1947.[54] The acetylcholine symposium held at the Army Chemical Center has also been published.[55] It has been shown that the nervous symptoms may be correlated with the inhibition of the enzyme cholinesterase found in nervous tissue.[56] This enzyme, which is presumably important in the chemical transmission of the nervous impulse, splits acetylcholine into its component parts, acetic acid and choline. The cholinesterases of animal tissue have been divided into two classes, true and pseudo or non-specific, on the basis of affinities for various substrates and inhibitors. For example, Adams, *et al.*,[57] and others have shown that cholinesterase hydrolyzes mecholyl but not benzoylcholine while the reverse holds true for pseudocholinesterase. Gordon has shown that N-diethylaminoethylphenothiazine is a specific inhibitor of pseudocholinesterase. The true esterase is found in central nervous system tissues and red blood cells and the peudo ester is most abundant in serum. DFD inactivates both types.[58,59] Nachmansohn, *et al.*, have offered suggestive evidence for a stoichiometric combination of DFP and partially purified true cholinesterase from the electric eel.[60] The inhibition which most workers believe to be irreversible except under certain conditions[61] leads to severe symptoms and death of the animal by inactivating nervous function. The exact relationship between cholinesterase and the transmission of the nervous impulse is not completely clear.[62,63,64,65] However, the inhibition of the enzyme is definite, and the correlation between toxicity and enzyme inhibition well established.[63] Further work has shown that DFP in high concentration abolishes nerve conduction by increasing the threshold of excitation and may in fact be unrelated to its anticholinesterase activity at low concentration.[66] That the inhibition is not restricted to animal cholinesterase has been recently shown by Jansen, *et al.*,[67] who found that acetylesterase of plant origin was likewise inhibited by DFP. This reagent does not react with essential sulfhydryl groups of the enzyme, since enzymes such as urease and papain which contain reactive sulfhydryl groups were not affected. More recent work by the same group has extended the findings to the esterase activity of trypsin and chymotrypsin using P^{32} as an indicator of combination with active centers of protein.[68,69] It is interesting to note that another enzyme has been found in animal tissue which is capable of hydrolyzing the phosphorus-fluorine bond, thus providing the mechanism for the *in vivo* hydrolysis of the alkyl fluorophosphates.[70]

Fluoroacetic acid is generally believed to function as an antimetabolite or metabolic antagonist for acetic acid. This latter compound is normally one of the most important two carbon fragments utilized by the animal organism. It is derived from the metabolism of carbohydrate and may either be further burned as a source of energy via the Krebs cycle or be built up into complex molecules such as fatty acids or steroids.[71,72,73] The disruption of metabolism oc-

curs wnen fluoroacetic acid inhibits the utilization of acetic acid. The condensation of acetate to citrate prior to its being metabolized is inhibited and leads to the accumulation of acetate in tissue.[74,75*] It is interesting that if the inhibitor is added 25-30 minutes ahead of the substrate, ethanol which is presumably oxidized to acetate before being further oxidized is metabolized in the presence of fluoroacetate whereas added acetate itself is not. Thus, there is a difference in the oxidation of added acetate and acetate formed *in situ* from the metabolism of ethanol.[77] The correlation between carbon halogen bond distance and inhibitory power has been made and other halogens which have bond distances different from the C-H distance apparently are not inhibitory, whereas C-F bond distance which is extremely close to C-H bond distance is inhibitory.[75] This finding has been extended and substituted fluoro fatty acids have been studied. It has been observed that only fatty acids composed of even numbers of carbon atoms are toxic while odd are not.[78] This correlates very well with the fact that the naturally occurring fatty acids have even numbers of carbon atoms.

The mechanisms involved in the diminution of incidence of dental caries have been investigated. Data have appeared showing that carious teeth have a lower fluoride content than non-carious[79,6] and that the difference is greater in the enamel than in the dentine. An exception is the recent work by McClure which tends to refute this idea, and offers data to show no essential difference.[80] Also, it has been established that in areas where the drinking water has a moderate or high fluorine content, there is found an increased amount of fluorine in both enamel and dentine of the teeth. These teeth have surfaces which are harder,[81,82] less easy to indent mechanically,[83, 84,85] and less soluble.[83,86,87,88,89] It is interesting to note that the reduction in solubility has been studied in detail by Buonocore and the lead fluoride seems to have the greatest potency in this regard.[90] It has been postulated that fluorine substitutes for the hydroxyl group in the crystalline lattice of the mineral of which teeth are composed forming fluoroapatite instead of hydroxyapatite. The resultant increase in hardness decreases the sensitivity of the tooth to erosive agents which may initiate caries. Such teeth are of interest in that they are less soluble in acids and thus more resistant to organic acids. There has been noted in fluorine treated cases a diminution in the oral bacterial count of *L. acidophilous*.[91] Other agents such as iodacetate have been shown to decrease the incidence of *L. acidophilous* and reduce the incidence of dental caries.[92] It has been known for some time that fluorides depress enzymatic reactions and thus depress metabolism of yeast, bacteria, and mammalian tissues.[93] This then is another possible mechanism of fluoride protection since these bacteria produce lactic and other organic acids which could well start erosion of teeth where the surface has already been compromised. The relative importance of each of these factors is not known, but they are both known to be operative in reducing dental decay. That the latter may be less important is shown by the fact that if fluorides are applied locally, then only the teeth so treated are protected. This makes a local effect seem more important than a general effect, such as depression of oral bacterial count.[94]

Of the mechanisms of action of the inorganic fluorides, the enzymatic has received the most attention. This has been reviewed recently.[93] Many enzymes are known to be inhibited by fluorides. Some of the more important ones are: salivary amylase, acid and alkaline phosphatase, enolase, ATPase catalase, peroxidase, carboxylase, cytochromes, especially cytochrome C, succinic dehydrogenase, lipase, cholinesterase, and urease. Because of the enolase inhibition, anerobic glycolysis is depressed. The mechanism of this inhibition has been worked out. It has been shown that enolase is a conjugated metal protein and when crystallized as a mercury salt, is enzymatically inactive. In combination with magnesium, maganese, or zinc ions it becomes activated. Fluoride inhibits only in the presence of phosphate or arsenate since a magnesium fluorophosphate or arsenate complex is formed which displaces the magnesium from the enzyme. Thus, the fluoride ties up the metal and renders the enzyme inactive.[95] This same mechanism seems to be operative in the case of alkaline phosphatase for it has been shown that purified enzyme can be inactivated by dialysis and reactivated by bivalent metallic ions such as calcium, iron, manganese, zinc or magnesium. Fluoride, ortho- and pyrophosphate prevent this reactivation.[96] Catalase which is an iron containing enzyme presumably is inactivated similarly by fluoride. Another mechanism is presumably involved in the inhibition of the cytochromes since spectrophotometric data show that the iron is not complexed with fluoride and since there is no other logical point of attachment on the non-protein moeity, Borei thinks the protein itself is combined with fluoride iron:[93]

Inhibition of fatty acid oxidation by sodium fluoride (.001 M) has been reported in liver.[97] In the field of protein synthesis fluoride ion has been shown to inhibit the formation of the model peptide bond.[98] The opposite effect, that of activation of enzymatic reactions, has also been shown to be operative with low concentrations of fluoride ion.[99,100,101,102] The explanation offered for this phenomenon is that low concentrations inhibit synthetic reactions of the substrate, thus making more available for degradation. Recently it has been shown that fluoride causes increased oxygen consumption in a BCG strain of tubercle bacillus, an effect that is greatly dependent on pH.[103] Thus, it can be seen that in various fields of intermediary metabolism of car-

*More recent work seems to point to inhibition after rather than before the condensation to citrate.[76]

bohydrate, fat, protein, respiration, glycolysis and digestion important enzymes are inhibited by this agent.

Summary

THE various aspects of the problem of fluoride toxicity have been discussed. The ubiquitous distribution of this element has been pointed out. The acute and chronic toxicity and the important mechanisms of this toxicity are reviewed. Since it is even yet incomplete, more investigation will have to be carried out in order to complete the picture of this important present-day problem.

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The Nation's Center of Industrial Hygiene Research
— Cincinnati —

THE UNITED STATES Public Health Service on Thursday, September 14, 1950, formally inaugurated activities in its Industrial Hygiene Field Headquarters Laboratories in Cincinnati. Long prior to that date work was under way.

Within recent years, whenever any substantial portion of a Federal agency is removed from Washington, D.C., widespread belief is that this results from dread of prospective atomic bombing. In reality, the purpose of decentralization may more closely be identified with the better atmosphere for research elsewhere. Washington is little credited with continuing serenity conducive to provocative scientific inquiry.

The exact site in Cincinnati, and perhaps only by accident, locates these new research laboratories amid an historic background of hygiene and sanitation. Almost abutting the new headquarters is a venerable lead products factory. Within rifle shot is that plant wherein the first known cases of industrial pyrethrum dermatitis were detected. From the roof top may be seen that section of Cincinnati in which, near 1832, the world's first water-connected bath tub was installed.... a landmark in personal hygiene. Overlooking the new laboratories from a proud hill is a famous pottery in which silicosis is at least a potentiality. These governmental laboratories appropriately are nestled within their own domain of usefulness.

The Division of Industrial Hygiene, functioning under DR. LEONARD A. SCHEELE, the Surgeon General of the United States Public Health Service, has as its Chief, DR. JAMES G. TOWNSEND. The Director of Industrial Hygiene Field Activities is MR. JOHN J. BLOOMFIELD. Immediately in charge of the Cincinnati Laboratories is DR. LEWIS J. CRALLEY. At the time of the formal work inauguration, the staff consisted of 30 specialists in divers fields but urgent requirement inevitably will lead to its augmentation.

The choice of Cincinnati as headquarters is fortunate and perhaps results from farseeing design, since also located in Cincinnati, at the College of Medicine of the University of Cincinnati, is The Kettering Laboratory of Applied Physiology under the direction of DR. ROBERT A. KEHOE. Thus, in one city, are situated the outstanding governmental industrial hygiene research laboratories and, at the same time, the nation's comparable laboratory dedicated in part to education and sponsored by private enterprise. This makes Cincinnati the nation's center of industrial hygiene research.

While the inaugural date, September 14, will serve as an almanac item in industrial hygiene history, the occasion was without formal ceremonies. The day was devoted to displays and demonstrations. The laboratories are divided into many sections supervised by many chiefs, and all laboratories are magnificently equipped with apparatus and instruments conducive to a high order of achievement. The building housing this assemblage of laboratories is far from pretentious. It bears no whit of resemblance to the Supreme Court Building in Washington, D.C. It is of store-type construction, shorn of ornamentation, and not likely to annoy any carping taxpayer. It is just what it professes to be.... a work place.

Invitations to share in the events of the day earlier had been sent to industrial hygienists, medical directors, educators within the field, and officers of national organizations. Joining the Washington staff of the Industrial Hygiene Division and the local Cincinnati staff, were other notables representing every aspect of occupational health. These included DR. HARLEY L.

Fig. 1.

Fig. 2.

Fig. 1 (left) The Field Headquarters Laboratories function under officials (left to right), John J. Bloomfield, Chief of Field Services, Dr. Lewis J. Cralley, Cincinnati Laboratories Director, and Dr. James G. Townsend, Chief, Division of Industrial Hygiene. Fig. 2 (right) At the open house

Fig. 3.

Fig. 4.

Fig. 3 (left) Among scores of representatives from industry were the Medical Directors of the Ford Motor Company and the Chrysler Corporation, Doctors Harley L. Krieger (left) and John J. Prendergast, respectively. Fig. 4 (right) The Military, in all of its branches is rightly concerned with industrial hygiene. Discussing military needs in industrial hygiene with Dr. Townsend is Brigadier General Otis Schreuder, USAF (MC)

KRIEGER, Medical Director of the Ford Motor Company, DR. JOHN J. PRENDERGAST, Medical Director of the Chrysler Corporation, DR. EDWARD C. HOLMBLAD representing the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and JOHN F. McMAHON and THEODORE F. HATCH, of the Industrial Hygiene Foundation. (On the following day, in Pittsburgh, the untimely death of Mr. McMahon occurred.) Other participants included DR. HAROLD A. VONACHEN, Medical Director of the Caterpillar Tractor Company, DR. ALLEN D. BRANDT, President of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, DR. CAREY P. McCORD, representing INDUSTRIAL MEDICINE AND SURGERY, and DR. RAYMOND HUSSEY of the American Medical Association. More than 200 physicians, engineers, chemists and physicists, including 26 members of the Kettering Laboratory staff, registered their approval of this governmental enterprise through attendance.

These Cincinnati laboratories include no facilities for clinical investigation. That aspect of industrial hygiene endeavor will continue to be conducted in Washington, D.C.

The Cincinnati program, as is appropriate, will not be rigid, but, instead, sufficiently fluid to meet the ever-changing requirements of industrial toxicology. Currently, emphasis chiefly will be directed to investigations of insecticides, radioactive isotopes, toxic metals, dusty lung diseases, and industrially threatening biologic agents. The little informed lay visitor, astonished at the endless variety of facilities, apparatus and equipment, might question the need for all such. To the contrary, let it be pointed out that all facilities, manned by a force much augmented over the present, readily might be directed over a period of years solely to the problems of the toxic properties of newer insecticides and pesticides. Many another single problem equally might command the combined services of the entire work force.

Work in these new Cincinnati laboratories is so prospective of achievement in the world of industrial hygiene that it is insufficient to designate the inaugural merely as a bench mark in that domain .... instead, it is the high water mark in industrial hygiene laboratory exploration.

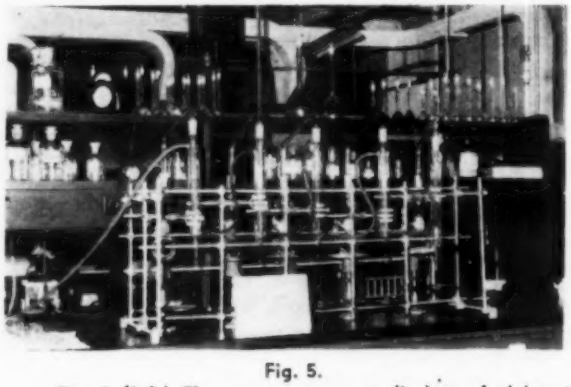

Fig. 5.

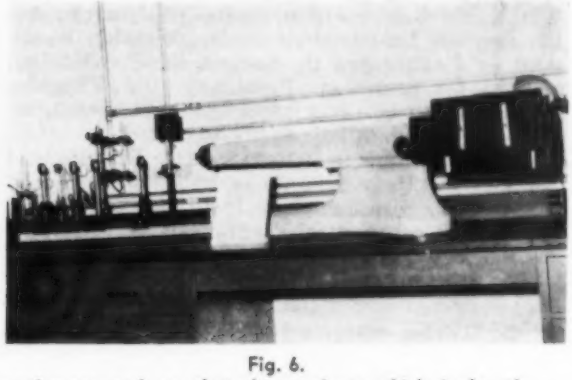

Fig. 6.

Fig. 5 (left) There were numerous displays of elaborate equipment such as that shown above which is for the quantitative determination of arsenic. Fig. 6 (right) Testing in an industrial hygiene laboratory requires complex apparatus. Traces of metal, among many other "unknowns," may be measured by spectographs

ASSOCIATION NEWS

THE PHILADLEPHIA INTERSTATE ASSOCIATION OF INDUSTRIAL MEDICINE had a successful dinner meeting on September 27, 1950, at the Philadelphia County Medical Society Building. Fifty-two members were present. LIEUT. COL. LAURENCE P. DEVLIN, Senior Medical Officer of the Military Department of Pennsylvania, gave an interesting talk about medical service in the event of atomic attack.

THE A.A.I.P.&S. Speakers' Bureau has now been developed to the point where a number of recognized authorities in the field of Industrial Medicine and Surgery are registered as being willing to address interested professional groups in various parts of the country.

AMONG the visitors to the A.A.I.P.&S. offices during the past several months were: H. W. LAWRENCE, M.D., Cincinnati, Ohio; J. R. GARNER, M.D., Atlanta, Georgia; EMERY B. NEFF, M.D., Moline, Illinois; ROLAND I. PRITIKIN, M.D., Rockford, Illinois; AARON S. LEVEN, M.D., Los Angeles, California; GEORGE S. LONG, M.D., Edmonton, Alberta, Canada; JOHN W. BROWN, JR., M.D., Corning, New York; and MISS RUTH S. SCHRAM and MRS. DOROTHY M. SCHRAM, daughter and daughter-in-law of our beloved past-president, DR. C. F. N. SCHRAM, who were interested in seeing the portrait of DR. SCHRAM as well as the portraits of other Past Presidents of our Association.

Meeting in Canada

THE joint annual meeting of the Section on Industrial Medicine, Ontario Medical Association, and the Industrial Medical Association, Province of Quebec, was held October 11 to 13, 1950, at the Hotel General Brock, Niagara Falls, Ontario. A. D. RICE was Chairman, and G. A. SINCLAIR, Secretary, of the Ontario section; W. H. CRUICKSHANK was Chairman, and E. A. TURCOT, Secretary, of the Quebec section. On Wednesday afternoon, with DR. RICE as Chairman, DR. EARLE STEELE, Chief Medical Officer, Workmen's Compensation Board of Ontario, read a paper on "A Study of the End Results of Some Phases of Traumatic Surgery"; DR. ANDREW ZINOVIEFF, Workmen's Compensation Board of Ontario, discussed "Rehabilitation and Resettlement After Industrial Injury," and DR. C. H. WILSON, Workmen's Compensation Board of Ontario, and Division of Industrial Hygiene, Ontario Department of Health, had the subject, "Industrial Dermatitis—Compensation Problem." On Thursday morning, with DR. CRUICKSHANK as Chairman, DR. E. C. HOLMBLAD talked on "Administration in Industrial Medicine"; DR. WILLIAM OILLE, University of Toronto, on "Heart Disease in Industry"; DR. H. T. MCCLINTOCK, Director, Gage Institute Chest Clinic, on "Tuberculosis Control Programme for Industry"; and DR. WILLIAM LINE, Professor of Psychology, University of Toronto, on "Industrial Health and Human Relations." The luncheon speaker was MR. JOHN DIBBLEE, Personnel Director, Hydro Electric Power Commission of Ontario, who spoke on "Human Relations in Industry"; and the dinner speaker was MR. ROBERT H. SAUNDERS, Chairman, Hydro Electric Power Commission of Ontario. On Friday morning, with DR. SINCLAIR as Chairman, DR. J. E. BARNARD, Division of Industrial Hygiene, Ontario Department of Health, discussed "Health Hazards of the Newer Insecticides"; and DR. R. B. SUTHERLAND and MR. W. H. BISHOP, Division of Industrial Hygiene, Ontario Department of Health, talked on "Collection and Utilization of Lost Time: Sickness and Accident Records in Industry." At luncheon DR. E. C. HOLMBLAD told of the "Future Role of the Physician in Industry." On Friday afternoon, with DR. TURCOT as Chairman, PROF. P. E. IRELAND, University of Toronto, discussed "Ear, Nose and Throat Problems in Industry"; DR. R. G. C. KELLY, University of Toronto, treated of "The Eye in Industry"; and DR. S. D. GORDON, University of Toronto, presented "Electric Burns." The meeting was attended by about 75 industrial physicians and surgeons from the Provinces of Ontario and Quebec. These groups have interesting joint meetings, alternating each year between Quebec and Ontario. The program was excellent with unusual audience attention. Many took their wives, who joined in the luncheon and dinner on Thursday, and all enjoyed an interesting tour through the Queenstown Generating Station of the Hydro Electric Power Commission of Ontario, on Thursday afternoon. The workings of the massive generators was most fascinating, as were the visits to the control rooms, with oil-immersion large breaker switches, inspection of Johnson valves and stainless steel reinforced blades on the turbine wheels, and delicate governors regulating the flow of water so as to keep the 39-ton generators revolving at 187½ revolutions per minute. The largest floral clock in the world has been planted here and it was a thrill to see the vast array of flowers blooming throughout the grounds on October 12. Buses took the visitors to the Gardeners Training School and grounds in the park on the way back to Niagara Falls. This is the only school for gardeners where the students and faculty are residents in beautiful dormitories on the grounds. Vistas and parkways of flowers, with a gorgeous display of chrysanthemums and rose gardens, formal trees, decorative hedges and lovely parkways made this a most enjoyable visit. The Friday visit and tour through the Ontario Paper Company at Thorold was another treat; and a splendid luncheon was served in the employees' recreation hall through the courtesy of the Ontario Paper Company and the plant Medical Director, DR. JAMES K. BELL. Well deserved is their pride in their fine medical department facilities and personnel.

INDUSTRIAL MEDICINE IN THE PUBLIC EYE

Diet and Industrial Performance

THE energy for physical work is derived in the last analysis from the food that is ingested. All would agree that efficient work performance would be impaired should the worker's diet become markedly imbalanced or insufficient in amount. A. Keys[1] pointed out in his review of the voluminous but frequently unsatisfactory literature on physical performance and diet that the real problem concerns the dietary measures by which it would be possible to improve the performance of individuals who are not clearly underfed or malnourished. One of such measures, for which experimental evidence was claimed by H. W. Haggard and L. A. Greenberg[2] is between-meal feeding.

The in-plant feeding, including between-meal feeding practices, became widespread during World War II. An account about development along these lines in Canada, the United States, and England was made under the auspices of the International Labor Office.[3] In the preface, F. G. Boudreau noted the lack of sufficient data on the relation of diet and working efficiency, and called for controlled studies of the influence of nutrition and work output.

H. W. Haggard and L. A. Greenberg believed that the decrement of industrial performance, observed frequently in the middle of the morning and the afternoon, is due to a decreased supply of energy-yielding substances. It was logical to recommend introduction of additional meals as a dietary measure designed to reduce or prevent muscular fatigue.[4]

It is well established that the blood sugar and the respiratory quotient rise after a mixed meal and then decline for several hours. If it is assumed that the level of the blood sugar is a valid index of the availability of carbohydrates for tissue combustion and if, in addition, it is assumed that the blood sugar concentrations within the range of "normal" (nonpathologic) variation may limit muscular performance, then a good theoretic argument can be made for maintaining the blood sugar at a high level by shortening the intervals between meals. It is only natural that Haggard and Greenberg have recommended for this purpose foods containing readily assimilable carbohydrate. The evidence for beneficial effects was sought along both the laboratory and industrial lines of research.

Subsequent researches did not confirm the laboratory results or required alteration in the interpretation of the data of Haggard and Greenberg. The authors claimed that the rise in blood sugar following ingestion of a meal was associated with a marked increase in mechanical efficiency as measured in laboratory work involving pedaling on a bicycle ergometer. The reported increases in efficiency amounted to 20 to 26% of the pre-meal value. Modern industry involves very little muscular effort. Consequently, the relevance of such a finding would be open to question even if the phenomenon were actually reliably established. This has not been the case.

J. Haldi, G. Bachmann, C. Ensor, and W. Wynn[5] have shown that after ingestion of glucose and fructose the respiratory quotient rose from 0.78 to 0.86 and 0.90. However, the muscular efficiency did not differ significantly from the values obtained in control experiments in which water alone was ingested.

In subsequent studies it was found that performance in severe exercise of short duration—swimming three laps of 33 1/3 yards—was the same two and a half hours after a high-carbohydrate and an isocaloric meal containing a low percentage of carbohydrate. At this time there was no difference in the blood sugar level.[6] The performance decrement in the second and third lap indicated that fatigability was not affected by the meal differences.

The investigations were extended to comparisons of a heavy meal (1051 calories), a light meal (551 calories), a light meal plus 50 g. of sugar, and a light meal plus 100 g. of sugar, with equally negative results.[7] The average swimming times varied very slightly (75.4 to 75.9 seconds). There was a rise in the blood sugar level after swimming a hundred-yard sprint but it was not related to the amount of nutrient taken two to three hours before swimming. The blood sugar level before exercise was the same in all four conditions.

The authors are careful to point out that the conclusions should not be applied, without further experimentation, to protracted and exhausting exercise. In the final of their series of laboratory studies, J. Haldi and W. Wynn[8] studied the effect of the carbohydrate content of isocaloric meals on performance on the bicycle ergometer. The load was adjusted so that the subjects were able to continue the exercise for 12 to 18 minutes before becoming completely exhausted. The test was repeated after 10 minutes of rest. In the two meals, eaten before the exercise test, 76 and 13% of the total of 1051 calories, were supplied by carbohydrate. The average amount of work done after the high-carbohydrate meal was higher by about 3%. The difference was not statistically significant and there was no significant difference in the percentage recovery. The net muscular efficiency was the same after both types of meal. It should be noted that the blood sugar concentration immediately before exercise was appreciably higher (145 mg. per cent) after the high-carbohydrate meal than after the low-carbohydrate meal (125 mg. per cent). There was no relation, within the limits of the experimental regimen, between the blood sugar level and the capacity for work. Thus one of the important bases of Haggard and Greenberg's argument seems to be not tenable.

During acute starvation, with the blood sugar level decreasing to 52 mg. per cent, the situation may be very different. H. Guetzkow, H. L. Taylor, J. Brozek, and A. Keys[9] found that the speed of motor reactions tended to decrease parallel to lowering of the blood sugar level. The coefficient of correlation between the two functions was +0.56 and +0.65. However, the correlation was negligible when the sugar concentration was more than 65 to 70 mg. per cent.

The effects of between-meal feeding on industrial production were investigated in a shoe factory. The operation selected for study involved sewing together the canvas parts of tennis shoes. Hourly

From *Nutrition Reviews*, June, 1950.

production was used as criterion of performance. There were 40 subjects divided into experimental and control groups. The control subjects ate three meals throughout the period of study and their average hourly output was almost constant (183 to 184 units). The experimental group alternated every two weeks between three and five meals a day, with mean hourly outputs of 175, 192, 176, 194, and 176. On the five-meal schedule the output was consistently higher. The two additional meals were provided without any cost to the worker and consisted of a glass of milk and a piece of angel cake weighing six ounces. These meals were served at the beginning of the third working hour both morning and afternoon.

The differences are striking. Unfortunately, the experimental conditions were not varied in a way which would make possible proper evaluation of the factors responsible for the increased output. The interpretation of the increase in production as resulting from high-muscular efficiency, maintained on a high level by the two additional meals, is hardly tenable. The work consisted of operation of power-driven sewing machines and represented, in terms of energy expenditure, light manual work. The drain on the total energy reserves was mild. It is not likely that in this type of work the work capacity of the muscles could be affected by the decrease in the blood sugar level present two to three hours after the morning or noon meal. It should be noted that the afternoon output curves showed a slump followed by a "spurt" at the end of the day in which only three meals were eaten, irrespective of the fact that the respiratory quotient continued to decrease. Obviously, the changes in output could not be ascribed to changing carbohydrate utilization.

Despite these criticisms, the work of Haggard and Greenberg is a valuable contribution to the study of industrial nutrition. It brings out the importance of the question of in-between-meal feeding and its effect on productivity. Further research is needed to confirm the phenomenon reported by the authors and to identify the factors involved. It has been known that rest-pauses alone, with no food, tend to have similar effects. Provision of extra food might have affected favorably the workers' morale and increased production without involving direct "physiologic" effects. Obviously, one of the tasks was to investigate the effect of intake of foods of varied nutritional values.

Such a study was undertaken by J. Haldi and W. Wynn.[10] The research was conducted in a cotton-bag factory. The operation selected for investigation involved sewing bags on electrically-driven sewing machines. The research workers obtained satisfactory cooperation both from the employees who served as volunteer subjects as well as from the management. The hourly output records were maintained for each subject. Because of variation in the kinds of bags to be sewed, the production data were expressed in terms of a standard hourly output.

Four types of meals were served for three consecutive weeks each morning (9:30 to 9:45 A.M.) and afternoon (2:30 to 2:45 P.M.). These meals provided approximately 650, 300, 150, and 80 calories, respectively. The order of refreshments served on a particular day was varied from week to week.

The average hourly production of 32 seamstresses was reported separately for the pre- and post-refreshment periods, both for the morning and the afternoon. Because there is little difference between the morning and afternoon values, the two periods may be combined. Thus the pre-refreshment outputs are 124.0, 122.5, 123.5, and 122.5 and the post-refreshment outputs are 136.5, 133.5, 134.0, and 133.5, for the four types of refreshment, respectively. In all instances the post-refreshment outputs were higher but there were no statistically significant or practically important differences between the four dietary regimens. In terms of wages received by the workers on the days when different refreshments were served, the differences ranged from 0.1 cent to 1.5 cents per hour.

The research workers concluded that work efficiency, in the type of industrial operations similar to that which was studied, is not affected by the amount of food eaten during the mid-morning and mid-afternoon rest periods. As one would usually expect, the energy reserves derived from the ordinary meals are sufficient, physiologically, for the day's work.

The increase in production observed in the second part of the morning and afternoon work period was present also on two days in which no food was served during the rest period, and cannot be explained in nutritional terms. The authors insist that this should not be interpreted as indicating that introduction of rest periods and provision of refreshments are not important from the point of view of industrial efficiency. Furthermore, where there are indications of a marginal nutritional status of the workers, serving between-meal refreshments, appetizing as well as nutritious, represents a valuable channel for improvement of the nutrition of industrial workers. In agriculture, with its greater demands on expenditure of physical energy, the mid-morning and mid-afternoon "lunch" is a well-established and firmly guarded tradition.

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An American Board of Industrial Medicine

MORE than 10 years ago at one of the sessions of the A.M.A. Section on Preventive and Industrial Medicine and Public Health, a resolution was passed seeking recognition on the part of the American Medical Association of industrial medicine as a specialty and calling for an American Board on Certification within that specialty. At that time, in addition to the A.M.A. Section, other organizations distinctly concerned were the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the A.M.A.'s Council on Industrial Health. Later the AMERICAN ACADEMY OF OCCUPATIONAL MEDICINE was formed and undoubtedly became equally desirous of appropriate certification for the qualified specialist in the field of occupational health.

Action in the furtherance of this enterprise has derived from the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS through its Committee on Certification, which committee has existed for the past 10 years. The other Committee interested in the matter has been that of the A.M.A. Section, as above. The two constitute actually a joint committee. Separately and together they are still functioning. On three occasions representations have been made to the Advisory Board to the Medical Specialties, the authoritative group. Originally the Advisory Board specified four objections to a certifying board: (1) Occupational medicine was not regarded as a specialty. (2) No specialized literature on the subject of occupational medicine existed. (3) Adequate under-graduate, and post-graduate facilities for training in medical schools and universities did not exist. (4) The proposed founding group was regarded as too large.

The ensuing years have clarified or dispelled these objections. Without extended argument it may be observed that: (1) The American Medical Association has tacitly recognized the specialty of industrial medicine through its own creation of a Council on Industrial Health. (2) Specialized literature, even then extensive, has become so voluminous that at the present time for single segregated topics, such as "silicosis," several thousands of titles may be assembled. (3) The American Medical Association's own inquiry has established the existence of training facilities ample to meet all requirements of those seeking specialized degrees. (4) The realignment of the proposed founder group readily may be accomplished.

During the intervening years there has been created and recognized, the American Board of Preventive Medicine and Public Health. By some, it has been assumed that the specialist within the field of occupational medicine naturally would be acceptable to this new board. However, the requirements for eligibility of this last mentioned group are such as to embrace only a portion of the total group serving in the field of industrial medicine. Without at this time appraising occupational health as an aspect of preventive medicine or public health, it may be granted at once that many highly skilled physicians, such as the industrial surgeons, perform meritorious services clearly not to be categorized as preventive medicine or public health. Therefore, a hiatus still exists.

In view of these mentioned developments within the past 10 years, distinctly the need exists that the AMERICAN ASSOCIATION OF INDUSTRIAL

PHYSICIANS AND SURGEON'S Committee on Certification, acting jointly with the A.M.A. Section Committee, and cooperating with those other groups already mentioned as inescapably identified with the enterprise, again should approach the Advisory Board, presenting the bettered situation that exists today.

Ultimately, the justification for diplomates of any specialty board is the protection of the public against medical services in low order. Certification facilitates recognition of superior medical qualifications among those so designated. That same need is requisite to the identification of superiority within the field of occupational health.

In this complex technological age chemistry, physics and engineering have developed to such an extent that one out of every five processes potentially has some direct effect upon the physiology of the worker which produces morbidity and mortality. These occupational affections only can be detected or prevented by the trained medical specialist in cooperation with the engineering industrial hygienist, both constantly on the job and both familiar with the working conditions and the product that is being manufactured. They alone can recognize the early signs of morbidity when it is curable and when further damage can be avoided. When advanced pathology is allowed to occur this means extended disability and possible death for the victim.

It is inconsistent and illogical to assume that an ordinary licensed practitioner of medicine is qualified to accept a position as medical director of a large plant, involving as it does great responsibilities. Over and above a high order of skill in the usual requirement of good clinical medicine and surgery, it is requisite that he be familiar with employment economics, legal requirements of medicine in industry, employment practices, insurance, compensation procedures, pensions, rehabilitation, mental hygiene, safety, plant sanitation, and industrial hygiene. Those physicians so equipped become specialists.

One of the tenets to which the A.M.A. adheres is the prevention of disease and accidents. There are now more than 60 million persons gainfully employed in this country. Where else can there be found such an opportunity under control, for the successful demonstration and application of preventive medicine, preventive surgery, and health education? The employee when visiting the plant dispensary encounters good medical practice and thereafter needs little persuasion in seeking the services of a skilled physician for himself and his family in medical matters unrelated to work origin.

In the United States during the past 50 years, scientists within the field of industrial medicine have added much to total medical knowledge through laboratory research and clinical observation. Occupational diseases due to physical and chemical factors have been well explored as to physiologic and pathologic effects through an endless array of devised tests, improved diagnostic facilities—all leading to bettered therapy, when preventive measures have not been successful. Pre-eminent in these investigations of work hazards, are those directed to the dusty trades, metallic poisoning, carcinogenic agents, abnormal atmospheric conditions, the industrial solvents, and industrial gases. The foregoing categories do not necessarily encompass the numerous work sources of skin diseases. The undeniable achievements of physicians and engineers in the field of occupational health invite comparison with the achievements in any or all other specialties in medicine.

All schools of public health and the majority of all medical schools provide instruction in industrial hygiene and industrial medicine, but not all at the same level. Essentially all state departments of health maintain industrial hygiene bureaus with well equipped laboratories, and trained personnel. The U.S.P.H.S., the U.S. Navy, the U.S. Army, and the Federal Bureau of Mines operate divisions of industrial health. In addition various other Federal and state agencies conduct activities within this field usually under the direction of physicians.

On an organizational basis—national, sectional, or state—industrial physicians are well assembled for group activities. Readily there may be named at least 30 organized groups of industrial physicians. As examples: national, the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS; sectional, the WESTERN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS; state, the MICHIGAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS. Manifestly, and without detriment, it may be agreed that much overlapping in membership exists.

Occupational health is adequately served by journals specifically dedicated to the field, notably *Industrial Medicine and Surgery*, and the American Medical Association's *Archives of Industrial Hygiene and Occupational Medicine*. On a regular publication basis are journals issued by Federal and state governmental divisions, Moreover it may be established, that almost without exception all medical publications, year by year, include titles specifically directed to occupational health. The literature is voluminous, and the rate of accretions is accelerated.

All in all, the attainments of occupational health to specialty rank may not be challenged, and the situation calls for no defensive attitude.

The need for certification here is as great as for any other medical specialty. Any other view is dismal. The wonder is, that long ago the total medical profession should not have spontaneously demanded the same professional safeguards as those accorded to the higher echelons of every other outstanding division of medicine.

The responsibility for the furtherance of this laudable undertaking clearly lies in the hands of those guiding the national organization within the field. Since already the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS through its Committee on Certification long has engaged in this pursuit, that body becomes obligated to the initiation of renewed action. This editorial by design is a call for appropriate new action—now. —ROBERT T. LEGGE, M.D.

"Cardiacs" Are Employable

READING the papers presented before the Cardiology Session of the NEW ENGLAND CONFERENCE OF INDUSTRIAL PHYSICIANS AND SURGEONS, it becomes apparent that most individuals who have inactive rheumatic valvular heart disease, hypertensive cardiovascular-renal disease or coronary atherosclerosis, are employable. This does not mean that such individuals should engage in hard manual labor but does mean that they may safely be employed at jobs which do not cause them to develop undue fatigue, breathlessness or anginal pain on exertion, dependent edema or other heart failure symptoms. "Cardiacs" should be employed only at jobs in which syncope due to some form of acute coronary or cerebral circulatory failure, will not endanger them or anyone else.

These conclusions are in agreement with those expressed by many speakers at the Conference on Aging held in Washington in August, 1950. They advocated the continued employment of men and women over 65 years of age even though most of them should be classified as having potential or possible, if not demonstrable, cardiovascular disease.

But it will be difficult to persuade employers to hire "cardiacs" and the aging as long as industrial commissions and courts continue to make awards, under the occupational disease laws, to many who happen to develop symptoms while at work. The papers presented at the New England Conference make it clear that there is little evidence that physical labor in any way modifies the course of rheumatic or coronary heart disease except when it causes acute coronary insufficiency with cardiac infarction but without thrombosis. This syndrome is initiated by unusually strenuous physical exertion, by exposure to extreme cold, or, as is more often the case, by a combination of these two factors.

When a certain type of work causes a "cardiac" or an aging individual to develop heart failure symptoms, he should be given adequate medical attention and then returned to work at a job requiring less mental and physical exertion, less exposure to inclement weather and causing less nervous tension even though the compensation, for the lighter work, is less.

It is hoped that it will soon be generally understood that heart and arterial diseases are rarely caused or aggravated by physical work even when the onset of symptoms may be related thereto; that heart and arterial diseases should almost never be classified as occupational diseases. The fact that acute coronary or cerebral circulatory failure is now all too frequently so classified, is a principal cause for the difficulty in obtaining work for "cardiacs" and the aged. Awards improperly made to "cardiacs" under the occupational disease laws give aid to a few, but make it difficult for many other "cardiacs" and for all over 45 years of age, to get jobs. Such awards, which tend to increase unemployment and dependency, are certainly not in the public interest. —NATHAN SMITH DAVIS, M.D.

The Macropygian Industrial Worker

IN FOOLISH fashion, the cartoonists depict the physician as a goatee-ed, roly-poly man with a head mirror on his forehead and a surgical saw in hand. The industrialist and politician are typed as paunchy and expansive. In equally foolish manner, the industrial worker is cartooned as lean and wearing a square cap. Some of us who have been identified with industry for as many as 40 years, have looked in vain for one of these square-capped workmen.

In the world of reality, all of this is changing. The industrial worker is becoming fat. For that matter, the entire nation is becoming fat. Obesity has come to be a forthright public health problem. The industrial worker is no greater offender than his non-industrial neighbor. It may not be denied that in times somewhat remote the industrial worker was oppressed with low wages so that leanness and malnutrition were almost inevitable. Insofar as obesity was absent, this state was beneficent. The shout of, "a full dinner pail," had real implications unknown to the present day. Now the industrial worker has joined the opulent and too many dollars are reaching into the belly. A thick panniculus adiposus is indisputably a private possession. Granting always the right of personal judgment, no industrial physician may demand

that the workers about him maintain sylphlike proportions. No less, there is the obligation on the part of industrial physicians, as well as all physicians, duly to publicize the fact that the distended waistline courts disaster. During the past 30 years, some 10 years have been added to the average life span of the industrial worker so that he more nearly approaches the average of his sex for the nation. Always the implied lag has been influenced by poor housing, poor nutrition, poor education and, in general, poor hygiene. As these threats disappear, there arises the new threat of shortened life through obesity. Every added 10 pounds above the optimum weight for any individual imposes a burden upon the cardiovascular system that is measurable and which may not be ignored. The industrial workers' prosperity is exacting a physical toll and cumulatively will exact a dire toll.

While statistics are not lacking, it is only necessary for the industrial physician to look out of his office window as workers stream to and from their work posts. Always with exception, there flow by men and women grossly macropygian, amphipygian and amorphopygian. Nor is all the obesity limited to the "pygian."

In the war years, the public, fettered with ration cards, with shortages of sugar, fats and alcohols, provided the best vital statistics in the nation's history. A shortage of sugar was the country's greatest boon for the period. Now, in a land of plenty, with no shortages and no lack of purchasing money, resulting obesity becomes an omen of disaster. The knowing industrial physician, maintaining a constructive program for the continuing physical and mental well-being of industrial workers, should not be blinded to the need for a new category in his over-all program .... the curtailment of obesity.

This enterprise by no means is limited to the future. Already E. I. du Pont de Nemours & Company, through the expectable long-range thinking of its medical department as embodied in DRS. GEORGE H. GEHRMANN and A. W. PENNINGTON, has devised and put into application a substantial program of obesity control chiefly through the medium of diet. This program has not been kept darkly under a bushel, for as early as June, 1949, this Journal presented DR. PENNINGTON'S initial publication. Wide public acceptance in and out of industry followed lay interpretations of this program, such as appeared in the June, 1950, issue of *Holiday*.

In the midst of merited condemnation of overeating by the industrial worker come the newer statements by Portis, Zitman and Lawrence that the "eager-beavers" among young executives are reaching pathologic fatigue because of hypoglycemia due to improper intake of carbohydrates. Thus industry is confronted with an upper as well as a nether millstone of malnutrition.

The Miracle Of The Month Club

BE NOT the first to accept the new, nor yet the last to discard the old." This ancient medical aphorism, daily needs to be refurbished to serve as an instrument of resistance to the current spate of miracles, near miracles, pseudo miracles, alleged miracles, and half miracles...but all triumphs. None save the addle-pated will deny the actuality of medical miracles. Unstinted acclaim only awaits their authentication. A genuine need is for some equivalent of a Geiger counter that infallibly will measure the half life of all items labeled "miracles." Some will possess a half life only equal to that of barium 131. At the risk of being invited to mark its mental antiquity by wearing the remnants of some Victorian bustle, this Journal displays ears cerated against the blandishments of miracle mongers until the miracle meter clicks off a prospective half life of at least five years.

Encased in this armor of righteous skepticism, the inevitable impact of chlorophyll as a dispeller of odors was awaited. Not always are editors lacking in need for enhanced social acceptability, and industrial workers in whose behalf we often speak not always are simon-pure as to odor offense. Disdaining published reports, we leaned on our own odors and our own laboratory. Temporarily the matutinal ablutions were abandoned until a nidorous state of no uncertain proportions was attained. Then the little green tablet. "Mirabile dictu," no odors. Next came the rush to the asparagus can, and again the little green tablet. That which without exception had always previously occurred, did not occur. In the laboratory, thioglycolic acid, with its villainous odor, was admixed in major strength with an unmeasured lot of chlorophyll in solution. There is scarcely any such thing as "just a little" thioglycolic acid odor, but in a trice only that level remained. Now we are paging all skunks and other mercaptan toters. Onion extracts in the test-tube behaved admirably under the tutelage of chlorophyll, but after an onion-extract mouth wash and another with chlorophyll, ugh, odors, dreadful odors, persistent odors. Truly our experiments were casual. Too, the possibility is that just as 10% of persons are non-responsive, so maybe 10% of onions are recalcitrant. Our onions were not the right sort. Withal, success. The doubting Thomases who came to scoff, remained for questioning prayer.

After all, maybe there is something to these monthly medical miracles.

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Ferlaino[1] has called attention to Tebrock's survey[2] covering 1,745 men and women, in which ANAHIST therapy was shown to have an incidence of only 2.5 per cent of untoward reactions; this is in striking contrast to the average of 23 per cent reported in Baughn's recently published large-scale study[3] of patients treated with various antihistaminics.

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1. Ferlaino, F.: Discussion in Indust. Med. 19: 413 (Sept.) 1950. 2. Febrock, H. E.: ibid. 19: 1 (Jan.) 1950. 3. Baughn, W. L.: ibid. 19: 413 (Sept.) 1950.

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Hazards

IN AUSTRALIA, we hear, insurance underwriters have decided that full compensation benefits should be granted to anyone who dislocates his jaw while yawning at work.

—*This Week*, October 14, 1950.

CHARLES C. MCCALL, former Glendale City Manager, has filed a claim for compensation with the State Industrial Accident Commission. He said he suffered back injuries while swinging in his swivel chair.

—UP from Glendale, California, in *New York Herald-Tribune*, September 23, 1950.

Constructive

HOW can you help?—Use the word "Constructive" which passes on the message. A great statesman may be called a great Constructive. That which you believe good can be referred to as Constructive. *Sincerely* and *Cordially* are fine one-word closings as is *Constructively*.

Education

THE continued reponsibility for the care of a chronically sick person adds immeasureably to the education of a physician. It requires maturity to be able to recognize limitations, to avoid becoming angry because the patient does not get well, to avoid become discouraged or discouraging, and to continue to wish to help within the limits of one's ability.

—JOHN ROMANO, M.D., *J.A.M.A.*, June 3, 1950.

Fatigue

EMOTIONAL reaction against everyday activities may produce hyperinsulinism with resultant fatigue. Dr. Sidney A. Portis, of University of Illinois, Chicago, believes that continuous stimulation of the right vagus nerve by emotional impulses may lead to irritation of the cells of the islands of Langerhans. A syndrome which includes apathy and a general let-down feeling results. A relative hypoglycemia usually supervenes. Atropine sulfate may be given orally to raise blood sugar levels. This treatment, with a diet low in free sugar, usually improves the patient's emotional state and reduces fatigue.

—*Modern Medicine*, August 15, 1950, abstracting from *J.A.M.A.*, 142: 1281, 1950.

Behavior

AN individual's behavior is dependent upon and determined by all experiences he has had from the time he enters the world until the present moment. Alfred Lord Tennyson expressed this idea perfectly in his "Ulysses" when he looked back over the span of his life and said, "I am a part of all that I have met." Shakespeare also must have had in mind the total personality with all the experiences that make it what it is, when he wrote "All the world's a stage,

How many *really drop* on the floor?

Every salesman of cheap hypodermic syringes has one stock argument which runs like this – "Why pay more because they all break when you drop them on the floor?"

Floors were just as hard forty years ago as they are today and nurses were nurses even then. Yet, in the past forty years the life of hypodermic syringes in hospitals has been extended many, many hours.

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and all the people in it merely players," and then describes the periods of life from infancy to old age and some of the experiences characteristic of each period. Cervantes in his "Don Quixote" realized the influence of environment on personality: "Show me your company, and I'll show you the kind of person you are." Abraham Lincoln said, "All of us are children of conditions, of circumstances, of environment, of education, of acquired habits, and of heredity, molding men as they are and as they will forever be."

—From Psychosomatic Medicine Practicable by the General Practitioner, by LUKE ELLENBURG, M.D., in *Illinois Med. J.*, August, 1950.

A Thousand Eyes

THE WISE OWL Club, founded in 1947 at the St. Louis plant of the American Car and Foundry Company, has been sponsored by the National Society for the Prevention of Blindness for the past 22 months. To be eligible for membership, a worker must prove that his goggles saved him from partial or complete blindness when an accident occurred. Clayre Pomeroy, a machinist at the Phoenix, Arizona, plant of the Reynolds Metals Company, recently received a special certificate as the 1000th Wise Owl.

Lag

THE possibilities of health education and health counseling techniques as part of industrial medicine have not been fully developed, a New York City Medical Director points out. In the August 7, 1950, issue of the *Rhode Island Medical Journal*, Dr. John J. Poutas, Lever Brothers Company, says in part: "It is a rare clinic visit which cannot be used as an entering wedge for good sound health counseling such as all doctors do in their office." A most important part of any industrial medical program is the anticipation, recognition, prevention and control of industrial hazards according to Dr. Poutas. "The nurse plays a major role in an industrial medical program. Many industries provide no service other than that offered by a nurse. In many instances where part- or full-time medical personnel is available, the nurse screens out those employees whom she judges should see the physician. In these decisions she is expected to be capable of independent professional judgment and should be acting in accordance with the written standing orders of a physician supervisor. The physician in industry should take the time to discuss interesting and important cases with his nurse. Only in this way will she be able to provide him and the employee with the necessary and important follow-up service."

—*Nursing World*, September, 1950.

A Cold

MOST of us take a cold in our stride and go about our work just the same. Maybe we growl a bit and feel rather nasty, but we think we can get by and it will soon wear off. What's wrong with this picture? In the first place, anyone who goes to the office or sends a youngster to school with a fresh cold is a public nui-

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sance. He needlessly exposes countless people to the infectious disease that causes the loss of more man-hours than any other. A few of those who get his cold may develop pneumonia or have an allergy or chronic sinusitis flare-up. As far as he himself is concerned, a cold may be only a cold; yet many others will develop complications or catch a superimposed infection if he doesn't reduce his contact with them. With efficiency at a low level during an acute cold, the benefits from working are far overbalanced by the risk incurred. From all points of view—public health, personal health and your own public relations with your associates—the important factors in the care of a cold are to stay home, be quiet, make yourself as comfortable as possible and keep your cold to yourself. Nobody else wants it. And nobody wants you when you have a cold."

—DONALD A. DUKELOW, in *Today's Health*, October, 1950.

"Bats by the Carload"

THE Chrysler Co. is said to buy "bats by the carload" for workers' ball teams. Firestone Rubber maintains an 18-hole golf course and clubhouse for employees only. Goodyear has a $2,500,000 recreation hall with 12 bowling alleys. General Electric workers in Cleveland boast 20 golf teams. P. R. Mallory Co., Indianapolis, sponsors fox hunting. Says Victor Riesel in a recent newspaper column, "Industrial psychiatrists disclose that sports competition gives the men a chance to blow steam and eliminate many of the little irritations down at the foremen's level, which result ordinarily in big losses of pay and production through fights and wildcat strikes . . . Understanding prevents hate. Healthy competition breeds wholesome relations. Thus everybody lives better, has more fun and earns more." Riesel finds American employers spending $300,000,000 a year on such programs . . . . We'd like to know more. If you promote sports, provide recreation facilities, tell us about it. Particularly, what you believe is accomplished and what evidence there is to prove it.

—*Personnel Journal*, July-August, 1950.

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Cholesterol Levels

DIETS designed to ward off hardening of the arteries have been based on the assumption that this condition is caused by high blood levels of cholesterol resulting from customarily eating liberal amounts of this material in animal foods. A recently reported study of several hundred men showed that the blood level of this fatty substance did not vary with cholesterol intakes over a range of 250 to 800 mg. daily. Even single large doses of cholesterol created only temporary and slight increases in blood cholesterol. By complete elimination of this substance from the diet, the amount in the blood could be lowered, but such diets were devoid of fat, were very low in protein, provided little sodium, and the energy intake was usually inadequate. The author

seriously questioned the utility of the so-called low cholesterol diets in current use for the prevention of hardening of the arteries.

—From *Science*, 112:79 (July) 1950, in *Nutrition News*.

Ionizing Radiation

DR. FRANCIS R. HOLDEN, Chief of the Health Physics Branch of the Radiological Defense Laboratory at the San Francisco Naval Shipyard, issues a statewide warning against hazards from the increasing use of radioactive isotopes in industry, in the September, 1950, *California Safety News*. While there are no known methods of preventing radioactive substances from releasing ionizing radiation, this can be prevented from striking man in harmful amounts. In many cases, distance is adequate protection, for radiation decreases as the square of the distance. In other cases, there must be a barrier of lead or concrete. Intensive studies of the effects of ionizing radiation on men and animals formed a basis for rules of safe handling of radioactive substances. These are included in California's "General Industry Safety Orders." Dr. Holden emphasizes that every person who regularly or frequently works with radiation generators or radioactive substances should become aware of the potential hazards of his employment, and the safeguards that will protect him.

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Horse sense about ATHLETE'S FOOT

91 skin specialists condemn old-fashioned foot baths as being "illogical and potentially harmful to the skin."
(Archives of Dermatology and Syphilology for April, 1942.)

The best way to prevent Athlete's Foot, say these specialists, is to *stop* trying to disinfect the feet. Concentrate instead on improving the condition of the skin.

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Originators of the skin-toughening method of Athlete's Foot Prevention

Seminar Summary

PACIFIC University, at Forest Grove, Oregon, for the five days ending June 9, was host to two groups of professional and industrial leaders from the Pacific Northwest. Under the sponsorship of the Portland Chapter of the American Society of Safety Engineers, loss-prevention men from Oregon and Washington industries convened for the first three days at Pacific's second annual graduate seminar for safety engineers. The first day was devoted to a panel discussion entitled "The Human Elements of Safety Control" led by Professors John W. Berry, D. David Darland, Richard Feinberg and J. Russell Roberts, all of Pacific's faculty. The following day the subject of "Conference Techniques" was explored under the leadership of Jack Frost, industrial personnel consultant, Seattle. The final day's activities were highlighted by a systematic survey of the problems involved in the management of personnel by Dr. Richard Feinberg, seminar chairman. Many of the participants stayed through June 8 and 9 for the workshop

on occupational vision, sponsored by Pacific University's new Institute of Visual Sciences. Their numbers were augmented by industrial physicians, illuminating engineers, ophthalmologists, optometrists, and company representatives from as far east as New York and as far south as California. The opening address by Dr. Richard Feinberg, seminar chairman, and Director of the Institute, sounded the keynote—"New Advances in Occupational Seeing." George Lewis, Safety Engineer, Portland Gas & Coke Company, outlined the vision program now in effect under his direction and presented data on the reductions in accident frequency and severity which have resulted from it. R. A. Sherman, Manager, Occupational Vision Department, Bausch & Lomb, Rochester, New York, gave information as to how occupational vision problems were receiving attention throughout the nation. Alfred J. Kreft, M.D., Portland physician and surgeon, approaching the subject from the standpoint of the individual workmen, declared that "to produce well in modern industry, the workman must have effective efficient vision, and must also be physically fit and mentally sound." He pointed out that it is a gross error to stress the importance of only one sense and neglect other health factors which contribute to the making of an efficient workman. Forrest E. Rieke, M.D., industrial physician, Portland, Oregon, drew from his wealth of experience in handling industrial accident prevention programs to offer a stirring picture of present inadequacies in dealing with occupational vision needs. Theron Fitch, Illuminating Engineer, Portland General Electric Company, "electrified" his audience with a resume of the general principles of illumination, illustrated by sound films showing specific applications in the home, school and industry. Walter J. Cornelius, industrial vision consultant, American Optical, San Francisco, presented a summary of his organization's contributions in the field of occupational vision testing and outlined the major channels along which future research may be expected to continue. Dr. Harold M. Haynes, Visual Training Laboratory, College of Optometry, Facific University, concluded the program with a discussion of the problems met and the general principles used by the optometrist who receives referral cases from industry for visual rehabilitation.

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*Derzavis, J. L.; Rice, J. S., and Leland, L. S.: Topical Bacitracin Therapy of Pyogenic Dermatoses; a Clinical Report, J. A. M. A. 141:191 (Sept. 17) 1949.

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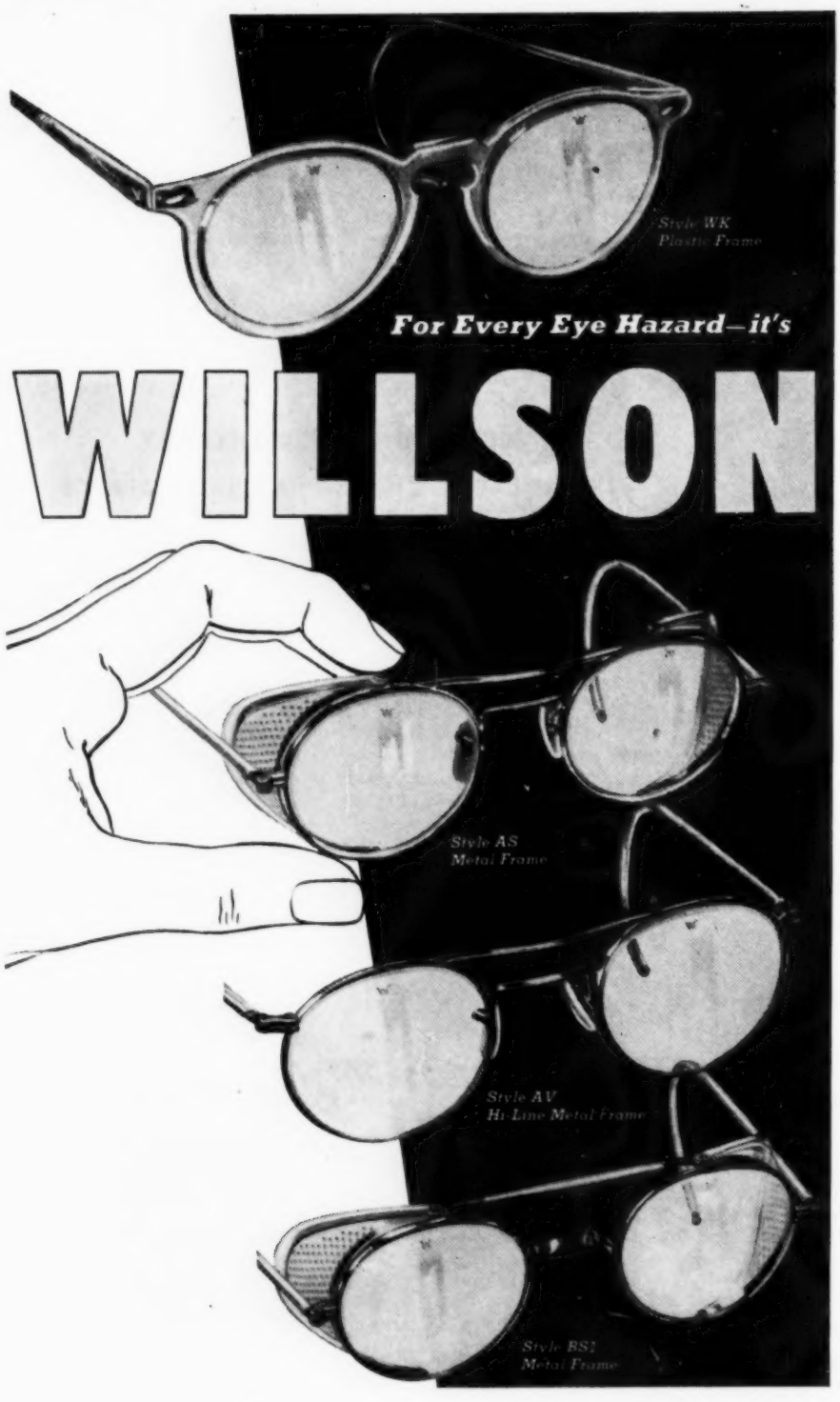
Tularemia

THE Educational Committee of the Illinois State Medical Society, in a "Health Talk," cautions the public, hunters and housewives particularly, to be alert to the dangers of tularemia or rabbit fever. This infection is found in small wild animals, such as rabbits, hares, field mice, opossums, squirrels, coyotes and skunks. It is acquired by man either by direct contact with sick animals or by bites of insects which have fed on them. Tularemia takes its name from Tulare County in California where the causative germs, Bacterium tularense, was first identified in ground squirrels. Hunters, trap-



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pers, butchers or housewives who skin and clean infected rabbits acquire the disease through some abrasion or even through apparently unbroken skin. Eating improperly cooked infected meat or drinking contaminated water may also be channels of infection. The incubation period is from three to five days. Headache, chills and fever are the first manifestations. Weakness, loss of weight, prostration, backache, joint pains and drenching sweats mark the acute stage, which lasts two or three weeks, after which the fever drops gradually. The fever is always high, 104 to 105°. Because of the debilitating effect of the disease, convalescence usually takes two to three months. If the infection occurs through a cut or abrasion, an ulcer develops at the site, and the lymphatic glands in the area become swollen. In other instances, the glands may swell without the appearance of an ulcer. Some cases resemble typhoid fever or pneumonia. If the infection occurs about the eyes, the conjunctiva is likely to show ulcers. If infected meat is eaten, ulcers may develop in the mouth or the pharynx. Tularemia can be prevented by following a few simple precautions, particularly in the dressing of game, especially wild rabbits. Hunters and housewives should use rubber gloves. By nature, rabbits are frisky. Actually, then, hunters should avoid shooting rabbits that are inactive or appear ill. Rabbits found dead should not be handled, and all rabbits whose internal organs are marked by small white spots should be destroyed. Especially important is the thorough cooking of the meat of wild rabbits. In the preparation for cooking, the hands, after touching the fur or raw meat, should be kept away from the face, mouth and eyes, and all fur, refuse and contaminated paper should be burned. The rubber glove should be sterilized in boiling water

and the hands washed thoroughly with soap and hot water. A disinfectant, such as alcohol, applied to the hands after cleansing is valuable. All persons should take special precautions against the bites of ticks and fleas, but particularly when working in infected areas. Anyone manifesting the symptoms of tularemia should go to bed immediately and call a doctor, because of the seriousness of the disease. It must be remembered that one out of every 20 cases proves fatal. If one recovers from an attack, however, a permanent immunity is established. Under the supervision of a physician, streptomycin has been found beneficial in tularemia, particularly in minimizing the suffering and the weakening fever.

Self-Evaluation

THE industrial nurse can evaluate her services by showing: (1) The demand for her services by employees. (2) Contacts she has made with community agencies who can assist employees where needed. (3) Number of instances where her investigations have resulted in better sanitation. (4) Instances where she has been instrumental in decreasing hazards. (5) Instances where her counselling has resulted in better balanced individuals, more contented, and therefore, more efficient and better producers... Here are some questions which the industrial nurse may like to ask herself occasionally. (1) Do I work as quickly as I can efficiently? (2) Am I careful in everything I do? Or do I make too many mistakes? (3) Do I get along well with others, even when it means keeping silence when I'd rather speak my mind? (4) Does an unusual situation halt me, or can I usually work out a solution? (5) Do I put a lot of enthusiasm into my work of my own free free will? Or do I slow down whenever I can? (6) Am I a self driver or do I require driving and then resent it? If we drive ourselves, we feel no drive from others. (7) Do I spend my free time planning ways of improving conditions and the health of employees? (8) Do I adjust to changes easily or am I irritated and stubborn? (9) Am I inclined to be moody, or am I usually cheerful—a good actress—no matter what has happened? (10) Am I satisfied with what I know about my job, or do I continue my education by reading, attending meetings, or by attending school? (11) Do I make decisions easily? (12) Am I fair in my dealings with people? Do I give them the benefit of the doubt? Do I also forgive and forget? (13) Do I want responsibility, or do I prefer to do only what I am told, and that as fast as I can?

—From "Self-Evaluation and Job Satisfaction," by DOROTHY DOCKSTADER, R.N., *in What's New in Industrial Nursing*, July, 1950.

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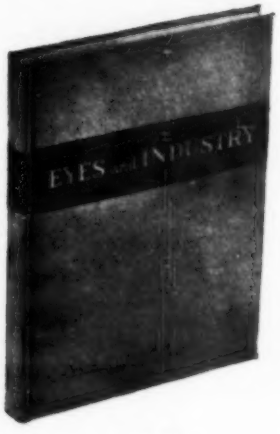

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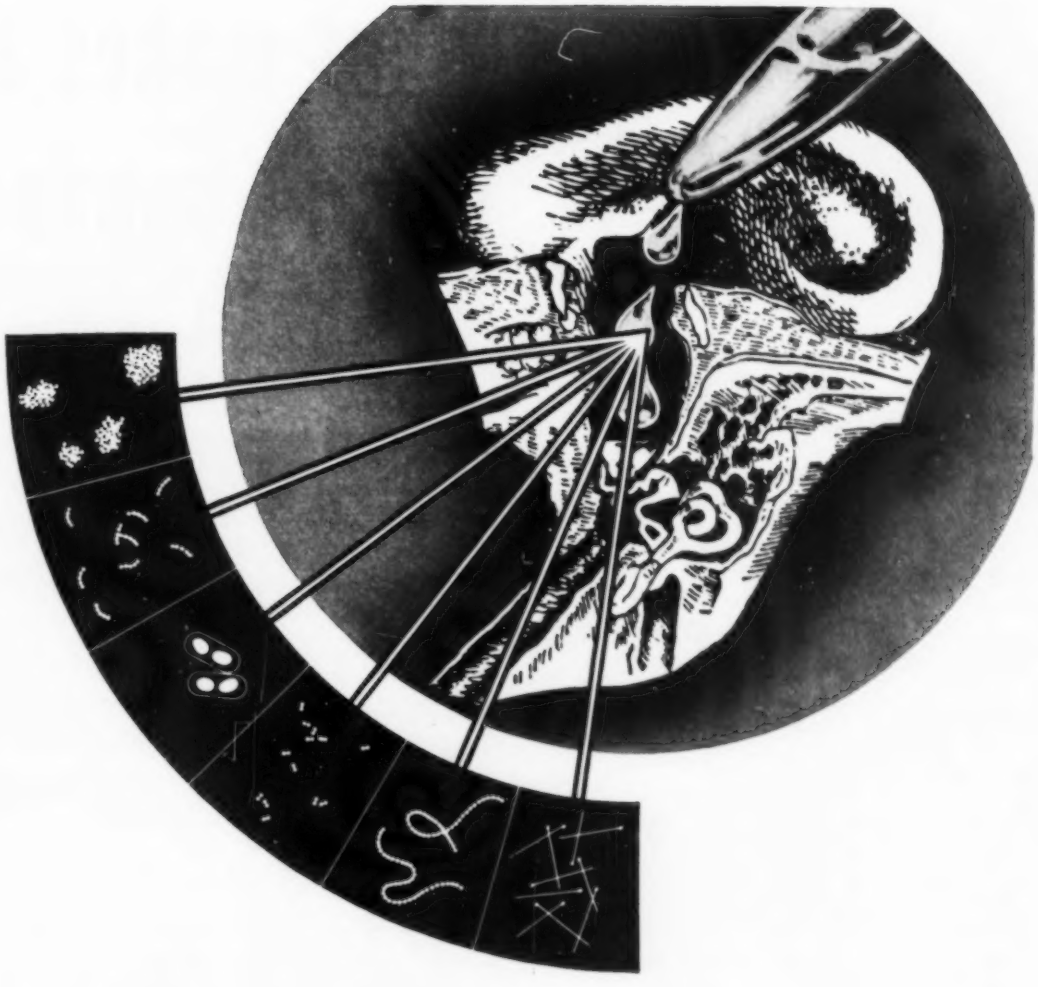

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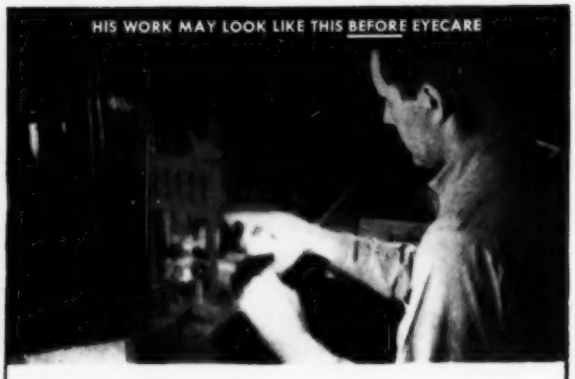

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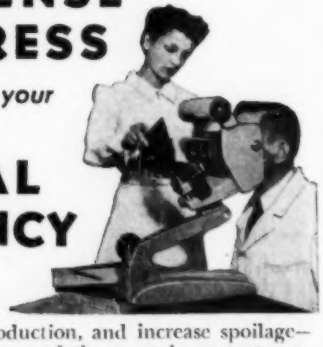

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LOWER production costs and training costs; lower labor turnover; less spoilage; reduced accident and insurance rates. **INCREASED efficiency,** larger profits; increased employee satisfaction.

Write for circular: **KEYSTONE VIEW COMPANY,** Meadville, Penna. Established 1892. Originators of Binocular Vision Testing in Industry.

KEYSTONE
Occupational Visual Service

Advertisers Index

Abbot Laboratories	12
American Optical Co.	40
Ames Company	35
Anahist Company	25
Bard Parker	28
Bauer and Black	22, 38
Becton, Dickinson & Company	27
Birtcher Corp.	42
Breck, John H., Inc.	18
Bristol Meyers Company	9, 11, and 3rd cover
Carbisulphoil Company	34
Ciba Pharmaceutical Co.	4th cover
Coca Cola Bottling Co.	34
Commercial Solvents Corp.	31
Desitin Chemical Co.	29
Dome Chemical, Inc.	33
Eaton Laboratories	2nd cover
Ethicon Suture Laboratories	1
Johnson and Johnson	15
Keystone View Company	42
Lilly, Eli and Company	24
Merck & Co., Inc.	20
Miles Laboratories	23
Mosby, C. V. Co.	36
Nepera Chemical Co.	14
New York Pharmaceutical	42
Onox, Inc.	30
Pfizer, Chas. & Co., Inc.	2
Phillip Morris & Co., Ltd.	39
Schenley Laboratories	5
Schering Corp.	7
Shield Laboratories	41
Smith, Kline and French	16
Standard Pharmaceutical Inc.	36, 40
Teckla Garment Co.	38
Truform Anatomical Supports	40
Wallace & Tiernan	36
Warner, William R.	21
White Laboratories	13, 37
Whitehall Pharmacal Co.	26
Willson Products	32
Winthrop Stearns	19
Wyeth, Inc.	17

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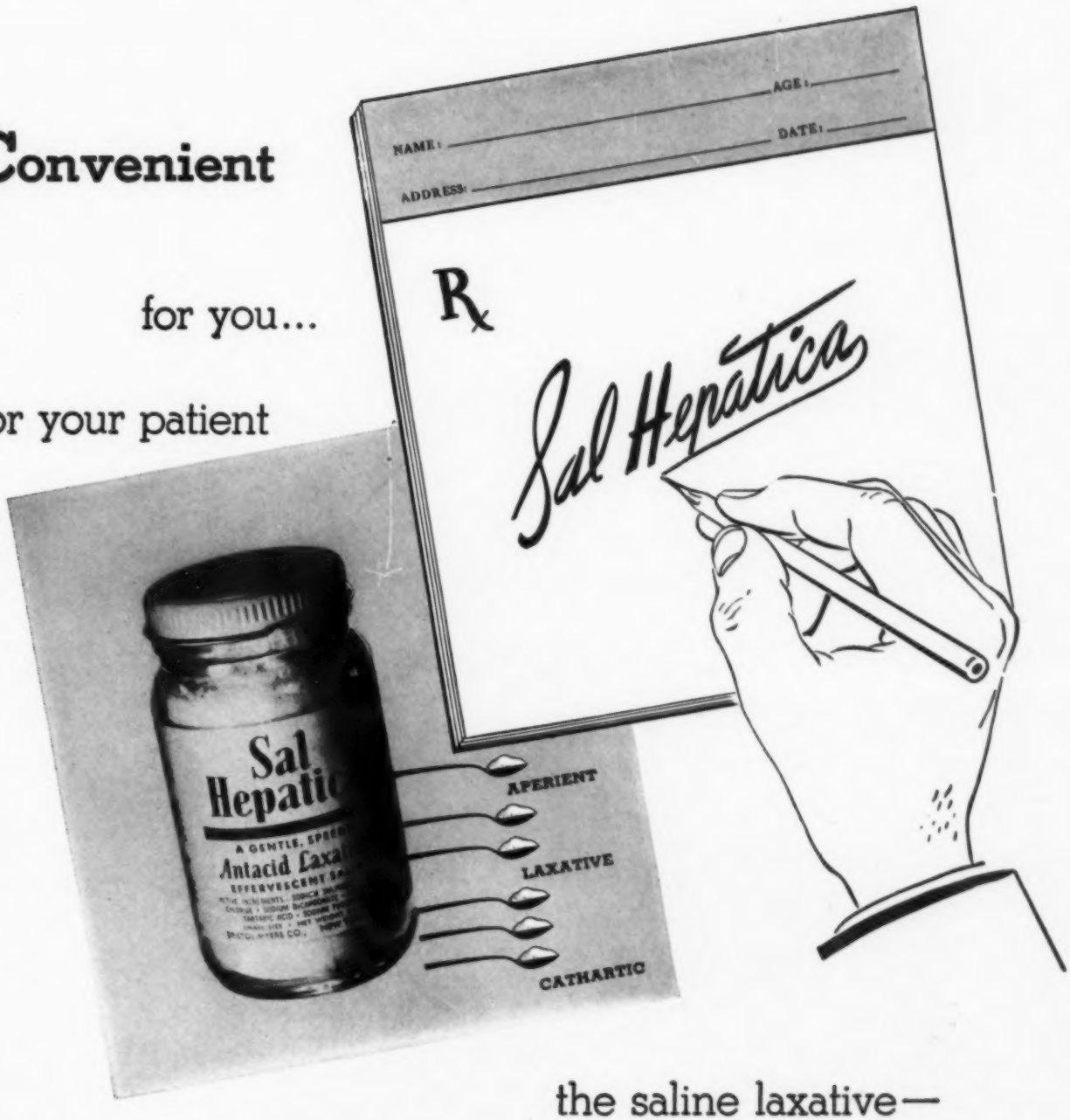

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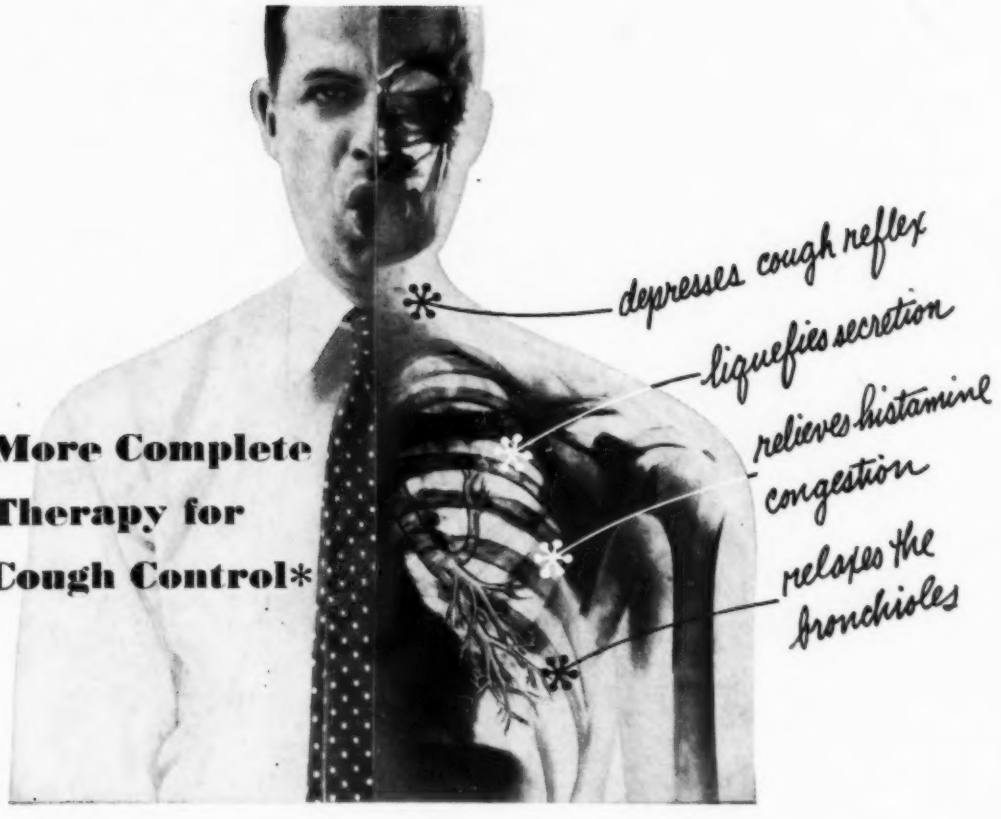

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